Chapter 2
Commercial Space for Competitive Advantage

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Introduction

The emerging commercial space ecosystem is opening new or expanding existing markets, along with playing a key role in the ever-changing global security landscape. Within the last decade, commercial space activities have expanded significantly in both scale and diversity, resulting in new capabilities and services that take advantage of off-the-shelf technologies and lower barriers for market entry. These recent developments are contributing to a burgeoning space industry driven by entrepreneurial innovation and investment, advanced technology, and decreased costs.

Space technologies—particularly commercial ones—play a substantial role in the conduct of everyday commerce and international trade, and because of growing demand, the number of satellites launched per year is growing exponentially (see Figure 1). Satellite deployment rates have increased nearly tenfold since 2014, driven by launches of commercial satellite constellations.[1] Those countries with space launch capabilities—including members of the European Union, Japan, China, India, Russia, and the United States—have greater control over scheduling whose satellite is launched and when (see Figure 2).

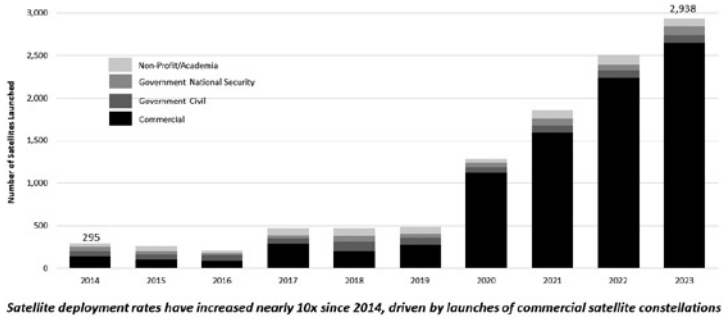

Figure 1. Number of Satellites Launched per Year by Operator Type (*BryceTech*)

[1] Nickolas Boensch, email message to author, February 6, 2024.

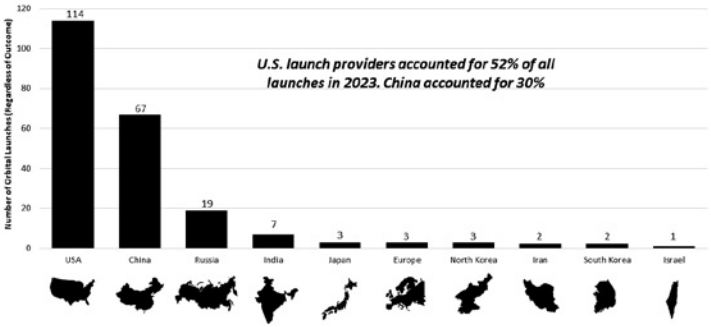

Figure 2. Number of Launches in 2023 by Country (*BryceTech*)

Many Western space strategies acknowledge the importance of the private sector in achieving political and military objectives. For example, the French *Space Defence Strategy* explains: "Alongside central governments, private-sector actors play a key role in the economic development of a space industry which is now more flexible, more innovative, more connected to other segments of the economy. The United States and China have long grasped the importance of this crucial turning-point for the development of our societies. Europe and France cannot turn a blind eye to an emerging area of potential conflict."[2] The emergence of disruptive innovation by space companies necessitates changes in the way France approaches the development of its space capabilities.[3]

According to François Raffenne, professor of European space studies at the Paris-based "SciencesPo" School of Public Affairs, "France's 2019 *Space Defence Strategy* underscores the need to more purposefully leverage commercial space to bolster national capabilities, provide additional resilience, and harness increasingly innovative services and systems coming from commercial providers."[4] The concept of "trusted operators" proposed in the strategy looks to define the conditions for greater industry engagement, but the lack of a clear legal definition has hindered the ability of the French Space Command to move beyond existing contractual relationships towards greater commercial integration.[5] Raffenne explains that "the lack of a clearly defined commercial integration strategy and

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2 French Armed Forces Ministry, *Space Defence Strategy* (2019), 4, https://cd-geneve.delegfrance.org/IMG/pdf/space_defence_strategy_2019_france.pdf.

3 Armed Forces Ministry, 4.

4 François Raffenne, email message to author, February 16, 2024.

5 Armed Forces Ministry, *Space Defence Strategy*, 9; Raffenne, email message.

limited funding for the acquisition of services within the French Programming Law [Military Planning Law] has, so far, limited progress."[6]

Moreover, Japan's 2023 *Space Security Initiative* emphasizes the importance of both allies and the commercial sector.[7] The document outlines the country's initiatives necessary for space security over the next decade and reflects those related efforts as part of Japan's Space Basic Plan, which is a cross-governmental initiative. In highlighting the need to work with other Western liberal democracies, the document notes that the purpose of Japanese space security is "to promote the peace and prosperity of Japan and the safety and security of our citizens through outer space, together with our ally, like-minded countries, and others to maintain the stable use of and free access to outer space."[8] Japan looks to cooperate with allies, along with strengthening domestic and international public-private partnerships to incorporate the commercial space sector's technological innovations and achievements.[9]

Commercial: Not Easy to Define

Even though the main theme of this paper is commercial space, reaching a consensus on how best to define what is and is not a commercial space entity proves elusive. Given that industry has played a pivotal role in delivering space capabilities and services for decades, the fact that *commercial space* is difficult to define may surprise some security experts and analysts. But it is exactly because categorizing commercial space proves elusive that it is especially relevant as part of irregular space warfare.

U.S. and Western Perspective

There are disparate definitions of what should be considered *commercial space*. Some consider a commercial activity to be one in which a private sector entity puts its own financial capital at risk and provides goods or services primarily to other private sector entities or consumers instead of the government.[10] Examples of these entities would be

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6 Raffenne, email message.

7 The Space Development Strategy Headquarters, Japan, *Space Security Initiative* (June 2023), https://www8.cao.go.jp/space/english/anpo/kaitei_fy05/enganpo_fy05.pdf.

8 Strategy Headquarters, 4.

9 Strategy Headquarters, 4.

10 Space Policy Online, "Commercial Space Activities," *SpacePolicyOnline.com*, updated February 6, 2025, https://spacepolicyonline.com/topics/commercial-space-activities/.

providers of direct-to-home satellite television (e.g., DirecTV and DishTV), satellite radio (Sirius XM), and commercial satellites delivering Internet services (e.g., SpaceX's Starlink and OneWeb).[11]

From a U.S. policy perspective, determining what is and is not commercial typically has two dimensions. The first dimension is risk-taking—especially financial risk—by entities other than the government. Generally, for a company's activities to be considered commercial, at least some private capital must be at risk or the company must sell to the private sector. The second dimension is the breadth of the customer base and the relationship between governmental and non-governmental customers.[12] These two dimensions are highlighted by the 2020 U.S. National Space Policy when defining *commercial*, which also notes the vital importance of the commercial space sector.[13] The policy document states, "The term 'commercial,' for the purposes of this policy, refers to goods, services, or activities provided by private sector enterprises that bear a reasonable portion of the investment risk and responsibility for the activity, operate in accordance with typical market-based incentives for controlling cost and optimizing return on investment, and have the legal capacity to offer those goods or services to existing or potential non-governmental customers."[14] This U.S. policy definition does include some ambiguous language, including: what is considered a "reasonable portion" of investment risk, and what constitutes "typical" market-based incentives? This lack of clarity is likely because U.S. government-wide consensus was unable to be reached in respect of providing more explicit language. Also, the definition of *commercial space* is not linked to the goods, services, and activities directly tied to space-based systems. The 2020 policy explains, however, that *commercial* is best understood within the context of providing goods and services to non-governmental customers.

Other definitions for *commercial space* are broader and include entities that sell consumer equipment, even when the satellite constellation enabling the capability is government owned. An example of this arrangement is the Global Positioning System (GPS) positioning, navigation, and timing satellite constellation, which is owned and

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11 "Commercial Space Activities," *SpacePolicyOnline.com*.

12 Irina Liu, Evan Linck, Bhavya Lal, Keith W. Crane, Xueying Han, Thomas J. Colvin, "Evaluation of China's Commercial Space Sector" (September 2019), 3, https://www.ida.org/-/media/feature/publications/e/ev/evaluation-of-chinas-commercial-space-sector/d-10873.ashx.

13 Executive Office of the President, *National Space Policy of the United States of America* (December 9, 2020), 20, https://trumpwhitehouse.archives.gov/wp-content/uploads/2020/12/National-Space-Policy.pdf.

14 Executive Office of the President, 20.

operated by the U.S. Air Force and used by a vast array of consumers for automobile navigation, cell phone use, and precision farming.[15] While consumer devices using GPS are sold by commercial companies, the satellite timing signal that makes them work is provided for free by the U.S. government.[16]

Another potential definition includes commercial entities providing capabilities and services to primarily government customers, such as through the United Launch Alliance between Boeing and Lockheed Martin.[17] Critics of this definition, however, do not consider these entities commercial because they are reliant on the government for most of their revenue and the government assumes the majority of the risk as the "anchor customer." Instead of being considered commercial, critics would call such entities *government contractors*.[18] Space Foundation makes a similar distinction in defining *commercial*: "All space-related endeavors—including goods, services and activities—provided by private sector enterprises with the legal capacity to offer their products to *nongovernmental customers*" (emphasis added).[19] Using Space Foundation's definition, a label of *commercial* necessitates that revenue or sales not be the sole or primary result of governmental customers, such as the U.S. Department of Defense or National Aeronautics and Space Administration.

As the previous discussion illustrates, what is considered a commercial actor may be unclear because of the active role of governmental customers. In these situations where doubt remains as to whether an entity is truly commercial—especially in a U.S. and Western context—the modifier *quasi* is helpful to highlight this ambiguity. According to the Nasdaq Stock Market, a quasi-public corporation is an entity that is operated privately but is supported by the government in its operations, even though it is often traded publicly.[20] Some public-private partnerships may have similar considerations because of a government and private nexus. The World Bank considers public-private partnerships (PPPs) a tool for governments to use to help deliver needed services, using private sector innovation and expertise. These PPPs often leverage private finance, and

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15 U.S. Space Force, "Basics of GPS," *Schriever.spaceforce.mil*, https://www.schriever.spaceforce.mil/GPS/.

16 "Commercial Space Activities," *SpacePolicyOnline.com*.

17 Boeing Corporation, "United Launch Alliance," *Boeing.com*, accessed June 15, 2025, https://www.boeing.com/space/united-launch-alliance/.

18 "Commercial Space Activities," *SpacePolicyOnline.com*.

19 Space Foundation Editorial Team, "Space Briefing Book," *SpaceFoundation.org*, accessed June 15, 2025, https://www.spacefoundation.org/space_brief/space-sectors/.

20 Nasdaq, Inc., "Quasi-public corporation," *Nasdaq.com*, accessed June 15, 2025, https://www.nasdaq.com/glossary/q/quasi-public-corporation.

in certain contexts, PPPs can be seen as a way to improve the provision of needed public services and facilitate economic growth.[21] Throughout the remainder of this paper, therefore, *quasi-commercial* will be used to refer to entities and activities that blur the line between purely governmental or non-governmental actions, including companies that operate in the private sector but also receive significant government backing.

Chinese Perspective

Consistent with the thought that there is no consensus regarding what constitutes *commercial space*, a 2019 study by the Institute for Defense Analyses, *Evaluation of China's Commercial Space Sector*, explains that, given the central role of China's state-owned enterprises (SOE), a proper understanding of China's commercial space sector requires a different, non-U.S.-centrist definition. The authors of the study explain that, to date, nearly all of China's accomplishments in space have been achieved by China's government, its state-owned enterprises (SOE), or its subsidiaries and suppliers. Historically, China's space industry has consisted predominantly of SOEs controlled by China's central or provincial governments. Since 1999, two SOEs—the China Aerospace Science and Technology Corporation (CASC) and the China Aerospace Science and Industry Corporation (CASIC)—have had a near duopoly on launch and space technology in China, with CASC serving as the primary SOE overseeing launch and space technologies.[22]

For the reasons above, the study's authors explain that what differentiates a commercial company in China varies depending on who is asked.[23] For example, many SOEs conduct commercial activities with the private sector, buying and selling goods and services from and to households and businesses. Many of these SOEs, however, prioritize state goals over making profit and do not face traditional market pressures because they receive government funding to offset any net losses.[24]

Ultimately, the study's authors define a Chinese commercial company as "an enterprise that is primarily operated in pursuit of profit, as opposed to an organization that prioritizes public policy goals over profits, even though it conducts commercial

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[21] World Bank Group, "Public-Private Partnerships (PPP): How can PPPs help deliver better services?" *Worldbank.org*, accessed June 15, 2025, https://ppp.worldbank.org/public-private-partnership/library/ppp-massive-open-online-course-how-can-ppps-deliver-better-services.

[22] Liu et al., "China's Commercial Space Sector," 1.

[23] Liu et al., 2-3.

[24] Liu et al., 3.

activities. Notably, this definition can include companies that are fully state-owned."[25] Based on this definition, China's space industry includes a variety of participants, from large SOE subsidiaries to small, privately-owned start-ups, with all being primarily motivated by the pursuit of profit. Some of these organizations—in particular, CASC, CASIC, and their subsidiaries—engage in commercial activities, which include buying and selling goods and services with the private sector.[26] As a result, there are now seventy-eight commercial space companies operating in China.[27] More than half of these companies have been founded since 2014, with the vast majority focusing on satellite manufacturing and launch services. To a large extent, China is viewed as having followed the same blueprint drawn up by the United States of using government contracts and subsidies to give companies a competitive advantage in the market.[28] A common theme between China and the United States is that both, at times, have strong linkages between the government and the commercial space sector.

While Chinese space companies may look private on paper, they must still acquiesce to government guidance and control, along with accepting some level of interference. It may be difficult for China's commercial entities to make the case to potential overseas and Western customers that they operate independently of governmental control and influence. The distinction between space companies that are truly private and those that are more or less state actors is still quite fuzzy, especially when the government is a frequent customer. "That could still lead to a lack of trust from other partners," explains China space scholar Namrata Goswami, and it does not help that the Chinese government is less than transparent about the ownership and leadership of its national space programs.[29]

Throughout the remainder of this paper, *commercial* and *quasi-commercial* space entities may both be mentioned to indicate the range of commercial entities' behavior and motivations while acknowledging that different interpretations of what constitutes *commercial* exist. Therefore, inclusion of the term *quasi-commercial* is meant to address those actors behaving in some respect like commercial companies, such as seeking profit and increased market share, even though they may not operate in a purely commercial

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[25] Liu et al., 4, 27.

[26] Liu et al., 2-3, 27.

[27] Liu et al., 6.

[28] Neel V. Patel, "China's Surging Private Space Industry is out to Challenge the US," *TechnologyReview.com* (January 21, 2021), https://www.technologyreview.com/2021/01/21/1016513/china-private-commercial-space-industry-dominance/.

[29] Patel, "China's Surging Private Space Industry."

sense and may have additional non-commercial interests and relationships. Including both commercial and quasi-commercial space actors is reflective of the breadth of relevant capabilities and services available during irregular warfare and competition in space.

Commercial Innovation for Competitive Advantage

For many security experts, technological innovation in the commercial sector is seen as an opportunity to achieve a competitive advantage over rivals. Governmental leaders often expect that entrepreneurial interest and investment in space companies will lead to significant changes in civil, commercial, and national security use of and access to space. Commercial space innovation is considered critical for developing novel ways of operating and protecting national security interests extending into space. Governments often see commercial space companies as a source for achieving strategic and political objectives while spending less than they would have otherwise. Because the commercial space sector is considered a means for achieving a competitive advantage among rival states, the sector will be instrumental in executing a holistic and practical space strategy.

Furthermore, governmental procurement professionals frequently seek to capitalize on commercial innovation to gain new capabilities using a faster, more responsive acquisition process. As a result of pacing innovation in the commercial marketplace, some national security space experts view commercial advancement as needing to inform not only which services can be commercialized, but also which mission areas should be the focus of space forces.[30] As a result, policymakers need to understand which space functions should be solely government-owned and operated and which functions are able to be integrated with or completely outsourced to commercial providers.

Many national security analysts expect that commercial activities will play a significant role during future competition and potential conflict in space. Strategies function in balancing desired ends with available means (see Figure 3), and commercial actors provide available means to support the desired ends of policy. This relationship results in commercial activities potentially playing a considerable role during competition, crisis, and conflict.

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[30] Doug Loverro, "If Commercial Space Is Ready to Set Sail, Why Are We Still Missing the Boat?" *Breakingdefense.com* (August 25, 2021), https://breakingdefense.com/2021/08/if-commercial-space-is-ready-to-set-sail-why-are-we-still-missing-the-boat/.

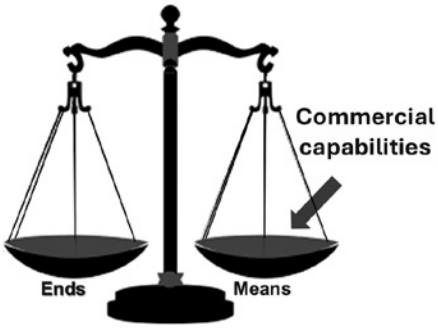

Figure 3. Strategy: Balancing Ends and Means (*author*)

Using Novel Commercial Technologies for Asymmetric Advantage

The use of novel commercial technologies will play a key role in space warfare's strategy. This is because the employment of commercial advanced technologies holds the promise of creating an asymmetric advantage between belligerents. In general, the employment of innovative technologies is an enduring part of both regular and irregular styles of warfare, but this is especially true during irregular forms of warfare where one competitor is less capable than the other. A less capable space power will seek any possible advantage and will try anything that might work to gain an edge during conflict, and the purpose of exploiting innovative technologies is to nullify one or more of the enemy's advantages. Therefore, the task of the disadvantaged space strategist is to alter the military balance to its benefit, which includes using novel technologies and weapons of war. The disadvantaged belligerent will likely eschew regular, conventional styles of warfare in favor of irregular modes where a technological edge can yield maximum benefit. For many space powers, the allure of finding a single, dominant technological solution to achieve any warfighting advantage will be just too great not to try.

Maritime history is illustrative of the relationship among innovative technologies, military advantage, and seeking asymmetric advantage. For example, the early adoption of torpedoes initially met with failure, but after evolutionary improvements to associated technologies and operational concepts, torpedoes eventually became operationally

effective.[31] The employment of weapons technology does not necessarily signify that its use is well understood from the beginning, which can result in a failure to produce meaningful results. The lesson here is that the use of new technology does not necessarily mean success, either tactically or operationally.[32] Also, during other maritime experiences, new ways of warfare, particularly irregular styles, were the impetus to test novel technologies in the hopes of achieving asymmetric advantage and shaping new operational concepts. Maritime historian Benjamin Armstrong explains, "Early innovations with steam power and undersea warfare demonstrated how irregular operations offered an opportunity for early adoption of new and disruptive naval technology."[33] While innovation and disruptive technologies offer important contributions during irregular warfare, sometimes change comes as evolution rather than transformation, and one should not expect too much too soon.[34]

For the space strategist, it is helpful to think of the technology's utility—including the application of commercial innovation—in terms of achieving strategic effect. Technology and its application are meaningless, in a strategic sense, in all aspects aside from the effects achieved and the realization of outcomes that positively affect a conflict's resolution at the strategic level of war. Particularly within the U.S. defense establishment, there is often a widespread belief that superior technology is always the answer without knowing what the question is—how will the war's outcome be affected? Bigger, faster, and higher are seen as the ultimate criteria for technological success, but such data exists in its own world of unreality.[35] Strategic effect is determined by the target and not by the means of attack. Therefore, advanced technologies in themselves will not determine whether strategic effect is achieved or not; rather, the manner in which technologies are used and whether the adversary's decision calculus is affected are what counts. A good space strategy is one that yields sufficient strategic effect to achieve political ends and make positive military gains. Strategic effect—the common currency earned through military behavior and action—is generated by the fortitude, blood, and treasure expended during conflict.[36]

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31 Benjamin Armstrong, *Small Boats and Daring Men: Maritime Raiding, Irregular warfare, and the Early American Navy* (Norman, OK: University of Oklahoma Press, 2019), 193.

32 Armstrong, 193.

33 Armstrong, 193.

34 Michael Howard, *The Lessons of History* (New Haven, CT: Yale University Press, 1991), 4.

35 Jeremy Black, *Rethinking Military History* (Abingdon: Routledge, 2004), 110.

36 Colin S. Gray, *Fighting Talk: Forty Maxims on War, Peace, and Strategy* (Westport, CT: Greenwood Publishing, 2007), 55.

Another important point is that advanced technology and its successful use can dramatically improve the morale of fighting forces. Historian Jeremy Black explains, "Providing troops with better arms than their opponents not only enhances their effectiveness but also their morale, a point that is frequently ignored."[37] The strategy of space warfare must embrace the central role that is human activity. While technology is an important dimension in warfare, warfare is primarily a human activity with a technological context, and not vice versa.[38] Advanced technologies can create a sense that the adversary can be beaten, thereby enabling a polity and its armed forces to envision victory and carry out space operations that were previously considered unrealistic. Technological success during combat can beget further success and improve a belligerent's morale during a protracted conflict in the space domain. On many occasions, wars are won or lost in the minds of the polities involved, and this applies to space warfare as well.[39] Because victory or defeat during space warfare will hinge on the beliefs, attitudes, and behavior of the public, any morale boost through the successful application of novel technology should be pursued.

Technology's Proper Place within Space Strategy

The influence of technology on the conduct of warfare and the development of strategy is still not fully understood within many military communities. This misunderstanding may indeed hold true in respect of technology's role in the development and execution of space strategy. Based upon historical experience, it can be expected that advances in space-related technology will be used initially in ways commensurate with the current military and operational paradigms. Therefore, in the near-term, space operations will likely continue to play mostly supporting roles—albeit important ones—to operations on land, at sea, in the air, and in cyberspace. It may be some time until the strategic advantages of space-based or space-enabled operations are fully understood and effectively employed. While advances in space-related technology or space-based weaponry will not change the fundamental nature of warfare, these advances will change warfare's conduct and character.

There is a proper balance and perspective that must be sought when considering the

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37 Black, *Rethinking Military History*, 111.

38 Colin S. Gray, *The Strategy Bridge: Theory for Practice* (Oxford: Oxford University Press, 2010), 72.

39 Colin S. Gray, *Irregular Enemies and the Essence of Strategy: Can the American Way of War Adapt?* (Carlisle, PA: Strategic Studies Institute, March 2006), 25.

application of technological innovation, and Thomas Mahnken advises on the need to strike the right balance: "If the enthusiasts are guilty of hyping technology, the skeptics have all too often discounted the role of technology in war. Although technology is not the only—or necessarily the most important—determinant of success, its effects should not be ignored."[40] Mahnken notes that evolutionary advancements in precision guidance and stealth technologies are two examples where applying advanced technology had far-reaching strategic consequences.[41] A balanced understanding of technology's influence on the conduct of military operations can lead to the development of a more complete general theory of space strategy and suggest future operational style.

It is expected that space operations two hundred years from now will look significantly different from the space operations of today. To get a hint of how space operations of the future will be different from today, one can compare maritime operations during the Age of Sail to modern maritime operations. Just over two centuries ago, transoceanic shipping traveled using primarily the seasonal prevailing winds, and shipping that tried to deviate from the prescribed seasonal trade routes was at risk of taking an excessive amount of time to reach an intended destination, or not reaching the destination at all. It was not until the use of coal-fueled steam engines that transoceanic shipping was at last permitted to travel without being restricted by seasonal wind patterns.

Just as oceanic travel of the past was dictated by seasonal wind patterns, many space operations today are determined primarily by orbital mechanics or the gravitational pull of celestial bodies. In the future, when propulsion technology advances to the point where extended space travel is possible using more efficient sources of abundant energy, such as fusion reactors or advanced electric propulsion drives, it is expected that space travel will increase exponentially. Furthermore, improved propulsion technology will allow a state's interests in space to move beyond just near-Earth concerns and extend to cislunar regions and beyond.

Commercial Proxies and the Indirect Approach

There is growing interest in space actors using external third parties, whether state or non-state actors, during future crises and conflicts. Indeed, the histories of land and naval warfare repeatedly illustrate the use of third party organizations, groups, and participants

[40] Thomas G. Mahnken, *Technology and the American Way of War Since 1945* (New York: Columbia University Press, 2008), 220.

[41] Mahnken, 227.

when employing force to achieve political aims and strategic ends. During the conduct of land warfare, soldiers of fortune and mercenaries—those paid to fight, deciding to do so willingly on their own behalf, or third party auxiliaries hired out to another party by their own government —frequently have played a vital role during military operations.[42] In naval warfare, privateers have also played an important part, including during the early days of the United States. Soldiers of fortune, mercenaries, and privateers all relate to the concept of using proxies during war and warfare. These external third parties may be either national or extranational actors.[43]

Proxies are those organizations, groups, and participants acting on behalf of another. These third parties may intervene on behalf of a sponsor or benefactor to help influence events and achieve political aims. Within the context of irregular forms of crisis and conflict in space, commercial and quasi-commercial entities may act as surrogates for governments or other sponsoring organizations and groups. These sponsoring governments, organizations, and groups may look to commercial entities to provide emerging technology and novel capabilities for achieving political objectives and strategic effect.

Also, the use of commercial and quasi-commercial space actors can absolve the sponsoring party or benefactor from having to undertake its own direct action by outsourcing either benign or questionable activities to commercial third parties. Commercial space proxies would allow a sponsor to affect outcomes during competition and conflict while being at arm's length and avoiding direct exposure to potential military escalation and adversary threats. The use of commercial proxies during space warfare can make attributing either provocative or harmful actions more difficult, thereby preventing a sponsoring actor from being held responsible for a commercial proxy's action and avoiding an adversary's follow-on retribution.

Commercial as the Indirect Approach

The idea of commercial and quasi-commercial actors serving as an alternate method for achieving desired political aims and military effects corresponds to the indirect approach, as addressed by British strategist B. H. Liddell Hart in his writing, particularly his

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42 Rodney Atwood, *The Hessians: Mercenaries from Hessen-Kassel in the American Revolution* (Cambridge: Cambridge University Press, 1980).

43 Stephen Biddle, *Nonstate Warfare: The Military Methods of Guerillas, Warlords, and Militias* (Princeton: Princeton University Press, 2021), xvi.

book *Strategy: The Indirect Approach*. In the book, Liddell Hart writes that the indirect approach incorporates the idea that strategy should adjust as the situation develops in war, along with achieving positive results separate from direct, large force-on-force engagements.[44] By incorporating the indirect approach into competitive and wartime strategies, policymakers and military leaders can achieve greater operational success with fewer casualties.[45]

Although Liddell Hart never addresses the concept of commercial proxies, the use of commercial surrogates by a sponsoring government, organization, or group is certainly in line with his thinking. The use of commercial and quasi-commercial entities can help achieve political aims and military objectives while obviating the need for a government to risk the destruction of its own fighting forces. The utilization of a commercial space sector's capabilities and services can help a sponsor achieve advantageous situations and decisive results, including throwing an adversary off-balance and leading to one's operational advantage, as Liddell Hart recommends.[46] Examples of commercial space proxies being part of the indirect approach are using commercial and non-governmental space services to conduct information operations to shape public opinion about a competitor's actions, using commercial surrogates to conduct cyberattacks against a rival's space-enabled communications networks, and using quasi-commercial entities to conduct rendezvous and proximity operations (along with non-cooperative docking) to coerce an adversary.

Buying Power and Creating Asymmetric Advantage

The commercial sector can also support a space strategy by enabling sponsors to purchase novel capabilities and services in order to create an asymmetric advantage. Fundamentally, sponsors of commercial proxies are able to convert fiscal capital and economic power into other forms of power to achieve strategic effects. This is simply buying power.[47] Even if a government, organization, or group does not have its own internal capabilities, it can simply procure the needed novel capabilities to deter or compel a competitor if it has the requisite fiscal means. Even if a government or organization has relatively minimal

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44 B. H. Liddell Hart, *Strategy: The Indirect Approach*, 2nd ed. (London: Faber and Faber, 1967, reprint BN Publishing, January 15, 2020), loc. 152 of 3881, Kindle.

45 Liddell Hart, loc. 2442.

46 Liddell Hart, loc. 2417.

47 John J. Klein, *Understanding Space Strategy: The Art of War in Space* (Abingdon: Routledge, 2019), 131-32.

domestic technological capacity, it can still achieve substantial political aims and strategic effect through the procurement of commercial capabilities and services.

Sponsoring states, organizations, and groups may enter into contracts or service agreements with commercial space companies to augment the sponsor's access to and use of space. Through the procurement of commercial companies' novel capabilities and services, the sponsor does not need to spend money upfront for the research and development costs of high-end space systems—as is common with many government-led space programs—but only pays for those commercial services for a specified purpose and duration. By not needing to spend money upfront on technological research and development, a sponsor can save costs, and such a contractual arrangement can give middle and emerging space powers greater access to capabilities and services that they would not have had otherwise. Importantly, many commercial space capabilities and associated technologies may be considered dual-use in nature, thereby causing ambiguity as to whether the space systems are solely benign or have military implications. By procuring commercial technologies and services, a state can lower its risk in a competitive environment by gaining additional dual-use capabilities to achieve an operational advantage over a rival.[48]

Sponsors who purchase a commercial proxy's capabilities and services can also create an asymmetric advantage with the potential of positively affecting the strategic level of war, or achieving strategic effect. Financial strength can be turned into other forms of commercial-enabled strength, and a small amount of money can be used to achieve big results. The commercial-enabled asymmetric advantage seeks to use fiscal means to create strength in order to exploit a rival's weakness and realize an advantage. A sponsor's expenditure of relatively modest financial means may result in deterring or compelling competitors. Ultimately, the commercial-enabled asymmetric advantage will be used to achieve strategic effect by exploiting any imbalances in the competitive environment between rivals. As part of a competitive strategy, sponsors of commercial proxies must fully understand their own strengths and weaknesses relative to an opponent when seeking to create an asymmetric advantage. That is what competitive strategies do: they exploit asymmetric advantage and the adversary's soft spots.

Commensurate with the fundamental concepts of asymmetric warfare and the indirect approach is using commercial capabilities during competition and conflict,

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[48] Dani Haloutz, "Air and Space Strategy for Small Powers: Needs and Opportunities," in *Toward Fusion of Air and Space: Surveying Developments and Assessing Choices for Small and Middle Powers*, eds. Dana J. Johnson and Ariel E. Levite (Santa Monica, CA: RAND Corporation, 2003), 148.

which is part of the precept of "trying anything that might work." There are several examples that illustrate a government, organization, or group buying power to create a potential asymmetric advantage: entering into a service agreement for commercial satellite communications with guaranteed availability throughout the peace-conflict continuum; purchasing commercial space launch services, whether as the primary payload or as a rideshare; procuring commercial on-orbit servicing and inspection capabilities; contracting for terrestrially-based space situational awareness services for detecting and tracking a competitor's satellites; contracting for active debris removal capabilities for use against a rival's defunct satellite in a non-cooperative manner; and acquiring commercial on-orbit, dual-use space capabilities to coerce a competitor.

Private Military Companies and Space Mercenaries

Commercial entities can directly support space warfare, especially during coercion and the use of force during irregular forms of warfare. This underlying concept is exemplified by today's routine use of private military companies, which are independent corporations offering training, logistical, security, and military services to national governments, international organizations, and other actors.[49] Peter Singer calls these commercial entities *corporate warriors* when highlighting the past role of private corporations during U.S. military conflicts in Iraq and Afghanistan.[50] Terrestrially, the work of private military companies ranges from running small-scale training missions to providing combat units composed of up to several hundred highly trained soldiers equipped with weapons platforms, such as artillery and main battle tanks.[51]

The use of private military forces is not a new idea: the idea is as old as warfare itself. Indeed, most of military history illustrates examples of privatized forces being used. Rulers of ancient Egypt and Rome used "armies for hire," or private forces, to supplement

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[49] Rodrick H. McHaty and Joe Moye, "The US Military Must Plan for Encounters with Private Military Companies," *Brookings.edu* (March 30, 2021), https://www.brookings.edu/blog/order-from-chaos/2021/03/30/the-us-military-must-plan-for-encounters-with-private-military-companies/.

[50] P. W. Singer, *Corporate Warriors: The Rise of the Privatized Military Industry* (Ithaca, NY: Cornell University Press, 2003), 2–3.

[51] Sean McFate, *Mercenaries and War: Understanding Private Armies Today* (Washington, DC: National Defense University Press, December 2019), 1, https://ndupress.ndu.edu/Portals/68/Documents/strat-monograph/mercenaries-and-war.pdf.

their imperial armies.[52] While maintaining a permanent, standing military may seem normal today, it was not the norm throughout history. Paying for one's own armed forces can be ruinously expensive, and renting fighting forces is much cheaper than owning them.[53]

International security scholar Sean McFate comments on the various terminology in today's lexicon seeking to differentiate *private military companies* from the pejorative term *mercenaries*:

> There is no expert consensus on who exactly is a "mercenary." Those in the industry, their clients, and some outside experts spurn the "M" word owing to the associated stigma, and give these private-sector fighters new labels: private military contractors, private security companies, private military companies, private security/military companies, private military firms, military service providers, operational contractors, and contingency contractors. Since the emergence of this new warrior class in the 1990s, volumes of academic ink have been spilt on differentiating them from mercenaries.[54]

McFate notes, however, that such labels fail to endure, explaining, "There is no shining line between these categories, and it all depends on the individual warrior's will and market circumstances." Frequently, academia overcomplicates an already complex phenomenon by seeking neat typologies, but these efforts really help no one.[55] It is exactly because private military companies are difficult to define—along with the uncomfortable recognition that private corporations routinely provide combat power—that the topic is relevant to the strategy of warfare in space.

Corporate space warriors should be expected to play a notable role during future competition and conflict. Although this may be a contentious realization for some policymakers and security experts, historical experience underscores the enduring use of private forces. Moreover, other governments and non-state actors are imitating the private military company model, with the commoditization of private force turning into a global

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[52] Alexander Casendino, "Soldiers of Fortune: the Rise of Private Military Companies and their Consequences on America's Wars," *Berkeley Political Review* (October 25, 2017), https://bpr.berkeley.edu/2017/10/25/soldiers-of-fortune-the-rise-of-private-military-companies-and-their-consequences-on-americas-wars/.

[53] McFate, *Mercenaries and War*, 10.

[54] McFate, 6.

[55] McFate, 6.

free market sector.[56] On the current and future use of private military companies, Sean McFate elucidates, "Those who think the private military industry can be safely ignored, regulated, or categorically banned are too late."[57] Through the use of corporate space warriors, states, organizations, and groups can outsource paramilitary services without needing to maintain a standing or permanent space capability. Also, private military companies that provide space capabilities and services can help hide a state's involvement, thereby escaping retaliation and international sanctions through plausible deniability.[58] Corporate space warriors give sponsors the flexibility to adjust to the complexities of a changing competitive environment, especially during the conduct of irregular forms of warfare.

In general, private military corporations can help support space warfare strategy in primarily two ways. First, corporate space warriors may provide a coercive presence. Private space entities may serve the ends of policy through presence, proximity, and the perceived threat of force, especially because of the dual-use applications of many associated space technologies. Private military companies' actions may fall short of any actual use of force or violence, but these actions can still play a significant part in a space warfare strategy. Corporate warriors may provide logistical services using dual-use, space-based capabilities, and these logistical services may include active debris removal, refueling, and inspection services. Second, even though private military companies cause consternation and make some policymakers uncomfortable, they may provide security and military services in, from, and through space. These security and military services may include the use of force, and private military companies can be used to compel an adversary to acquiesce on some contentious demand or change a previous decision. Furthermore, sponsoring states, organizations, and groups may use private military companies as part of a complex strategy to exploit the gray-zone gap between peace and war by using measures short of armed conflict, including the introduction of non-state military forces, contractors, and corporate warriors into the battlespace.

Hybrid Space Architectures and Their Potential Downsides

Some governments and defense agencies, like those within the United States, are seeking to take advantage of commercial advancements by blending governmental and

[56] McFate, 26.
[57] McFate, 43.
[58] McHaty and Moye, "US Military Must Plan for Encounters."

commercial architectures. For many government leaders, the commercial sector is seen as a way of achieving cost savings and incorporating innovative capabilities at the same time. Certainly, the commercial space sector is moving rapidly to provide robust and proliferated capabilities on-orbit, and so some consider it foolish not to take advantage of existing and planned commercial space capabilities.

The U.S. Space Force's space capstone doctrine describes *space system architecture* as the space, terrestrial, and link segments, all of which comprise a multi-domain approach that enables space capabilities and services.[59] First, the space segment consists of a spacecraft in orbit beyond Earth's atmosphere, and *spacecraft* refers to remotely piloted, crewed, or autonomous systems. Second, the terrestrial segment encompasses all terrestrial equipment required to operate spacecraft and satellites, and this includes control stations, antennas, tracking stations, launch sites, launch platforms, and user equipment. Third, the link segment comprises the electromagnetic spectrum and associated communication signals that connect the terrestrial segment and the space segment. Uplink signals transmit data from Earth to spacecraft, downlink signals transmit data from a spacecraft to Earth, and crosslink signals transmit data from one spacecraft to another.[60]

When considering existing space architectures, some space professionals view the interweaving of governmental and commercial architectures as a method to dramatically improve deterrence and space resiliency.[61] Deterrence efforts would be improved by distributing risk throughout proliferated, disaggregated, and diversified capabilities that operate across various orbital regimes.[62] Through the integration of governmental and commercial space architectures, it is possible to achieve greater diversity of capabilities and services while reducing any inherent vulnerability associated with using small numbers of high-value, exquisite governmental satellites.[63] Countries that integrate commercial systems and capabilities into their governmental space architectures can potentially achieve an asymmetric advantage over rivals by taking advantage of the speed of the commercial innovation cycle, novel technical capabilities, proliferated satellites,

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59 U.S. Space Force, "Space Capstone Publication: Spacepower Doctrine for Space Forces" (June 2020), 5, 37, https://apps.dtic.mil/sti/pdfs/AD1129735.pdf.

60 U.S. Space Force, 5, 37.

61 "Hybrid Space Architecture: Statement of Principles," SmallSat Alliance, accessed June 15, 2025, https://smallsatalliance.org/wp-content/uploads/2020/09/Hybrid-Architecture-Statement-of-Principles-v21.pdf.

62 Office of the Assistant Secretary of Defense for Homeland Defense and Global Security, *Space Domain Mission Assurance: A Resilience Taxonomy* (September 2015), 6-7, https://www.hsdl.org/?view&did=789773.

63 "Hybrid Space Architecture," SmallSat Alliance.

and diverse orbital regimes—all at significant cost savings when compared to using solely government funded efforts.[64]

Hybrid Space Architectures

As used in this paper, *hybrid space architecture* is the intermingling of governmental and commercial capabilities and services across the space, terrestrial, and link segments. The term *hybrid space architecture* is frequently used in the context of mixing small constellations of large, exquisite, and expensive governmental satellites with large constellations of smaller, less costly commercial satellites—with the combined architectures spanning various orbital regimes.[65] Certainly, there are other definitions of what entails a hybrid space architecture. SmallSat Alliance, for example, explains the concept thusly. "The Hybrid Space Architecture is the integration of emergent 'new space' smallsat capabilities with traditional US Government space systems."[66] Commercial space advocate Charles Beames views a hybrid space architecture as the preferred way for both the old and new space industries to operate as an integrated whole to support military, civil, and intelligence needs.[67] Beames explains, "With near parity in space competence and capability arising quickly worldwide, our government must no longer compete against, but instead harvest the innovations from the new commercial space sector. By integrating small, commercial space technologies, we can accomplish this and provide strength in numbers by mitigating vulnerabilities inherent in relying on a very small number of very expensive systems."[68] In general, a hybrid space architecture is understood as governmental and commercial constellations working in an integrated fashion, more effectively and efficiently than their individual parts.

For many within the U.S. defense community, moving towards a hybrid space architecture is considered vital. Gen. John Raymond, former chief of space operations, comments, "What we're looking at is to develop not a one size fits all, but a hybrid

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64 Charles Beames, "Why Hybrid Systems will enable the United States' Space Future," *Forbes.com* (November 29, 2019), https://www.forbes.com/sites/charlesbeames/2019/11/29/why-hybrid-systems-will-enable-the-united-states-space-future/.

65 Theresa Hitchens, "For Space Force, it's Acquisition, Acquisition, Acquisition: 2022 Preview," *BreakingDefense.com* (December 29, 2021), https://breakingdefense.com/2021/12/for-space-force-its-acquisition-acquisition-acquisition-2022-preview/.

66 "Hybrid Space Architecture," SmallSat Alliance.

67 Beames, "Hybrid Systems."

68 Beames, "Hybrid Systems."

architecture, with large and small [spacecraft] so you don't have a vulnerability."[69] Raymond elaborates on the advantages of a hybrid space architecture. "If you go to a more proliferated architecture, rather than the handful of exquisite capabilities, you then open the opportunities for more commercial collaboration and you open opportunities for more collaboration with our allies and partners."[70] For example, a future architecture for space-based communications may include a mix of both exquisite and mass-produced satellites, which is a mixture of both high-end and low-end capabilities.[71] Hybrid architectures also hold promise for remote sensing missions. Rather than relying exclusively on high-demand, low-density government owned satellites, commercial sensing satellites offer orders of magnitude more coverage and revisit rates that can augment and cue the sensing capabilities provided by more exquisite government owned and operated systems.

Potential Legal Implications of Hybrid Space Architectures

The intermingling of governmental and commercial space architectures raises legal questions, which must be fully considered and mitigated when using hybrid space architectures during irregular forms of competition and conflict. Specifically, questions pertaining to the principles of targeting and distinction are currently being raised on this exact matter. The intermingling of military and civilian space activities can blur the line between civilian and military property, and in theory, could lead some to construe commercial, or civilian, systems as being legitimate military targets under the Law of Armed Conflict.[72]

One of the underpinnings of the Law of Armed Conflict is the principle of lawful targeting, which is inclusive of the principle of distinction. Lawful targeting requires that all feasible precautions must be taken to ensure that only military objectives are targeted so that noncombatants, civilians, and civilian objects are spared as much as possible from

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[69] John Raymond, as quoted in Sandra Erwin, "Raymond: U.S. Space Command Needs Satellites to be Built Fast, to be Survivable," *SpaceNews.com* (September 17, 2019), https://spacenews.com/raymond-u-s-space-command-needs-satellites-to-be-built-fast-to-be-survivable/.

[70] John Raymond, as quoted in Sandra Erwin, "Military Space Chiefs from 15 Countries Gather amid Growing Security Concerns," *SpaceNews.com* (April 4, 2022), https://spacenews.com/military-space-chiefs-from-15-countries-gather-amid-growing-security-concerns/.

[71] Erwin, "Military Space Chiefs Gather."

[72] David A. Koplow, "Reverse Distinction: A U.S. Violation of the Law of Armed Conflict in Space," *Harvard National Security Journal* Vol. 13, iss. 1 (2022): 25-26, https://harvardnsj.org/wp-content/uploads/2022/01/HNSJ-Vol-13-Koplow-ReverseDistinction.pdf.

the ravages of war.[73] Undergirding this principle of targeting is that distinctions between combatants and non-combatants must be made to spare injury to non-combatants as much as possible. Consequently, under lawful targeting, all "reasonable precautions" must be taken to ensure only military objectives are targeted, so that damage to civilian objects (collateral damage) or death and injury to civilians (incidental injury) are avoided as much as possible.[74] Military objectives are combatants and those objects that, by their nature, location, purpose, or use, effectively contribute to the enemy's warfighting or war-sustaining capability. Additionally, civilians and civilian objects may not be made the object of attack. Civilian objects consist of all civilian property and activities other than those supporting or sustaining the enemy's war-fighting capability. The principles of targeting and distinction have implications when considering commercial satellites and their use during armed conflict.

David Koplow, legal scholar and Georgetown University law professor, highlights the potential downsides of today's general practice of intermingling commercial and military space infrastructure and architectures. Koplow comments that blurring the distinctions between civilian and military space systems and architectures poses serious implications for commercial customers and foreign nations.[75]

Explaining his concern over hybrid space architectures within the context of the Law of Armed Conflict, Koplow explains, "This intermingling runs afoul of one of the most central requirements of the traditional law of armed conflict: the principle of distinction (or discrimination), which mandates that in combat, states may lawfully direct their attacks only against military objectives, not against civilians or their property."[76] Moreover, he explains that an important corollary of this principle is that of *reverse distinction*, which requires a state to separate its military assets from civilian objects to the extent feasible. This precaution is necessary in order to spare civilians and their property from the ravages of warfare while enabling an adversary to make the distinction when directing armed attacks against only military targets.[77] Koplow makes the point, however, that reverse distinction is a somewhat "soft" obligation and this duty is not absolute. Consequently, parties are committed only to use their best efforts to separate military and

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73 U.S. Navy, U.S. Marine Corps, and U.S. Coast Guard, *The Commander's Handbook on the Law of Naval Operations*, NWP 1-14M/MCTP 11-10B/COMDTPUB P5800.7A (Aug 2017), 8-1, https://www.gc.noaa.gov/pdfs/CDRs_HB_on_Law_of_Naval_Operations_AUG17.pdf.

74 U.S. Navy et al., *Commander's Handbook*, 8-3.

75 Koplow, "Reverse Distinction," 25-26.

76 Koplow, 25-26.

77 Koplow, 25-26.

civilian assets to the "maximum extent" feasible.[78]

Providing an alternate viewpoint on the same concern is legal scholar Charles Dunlap.[79] Dunlap explains that determining if something is "feasible" can properly include the cost and practicality of creating a parallel system. In highlighting the potential impracticability of a reverse distinction corollary, Dunlap explains, "In theory, a government might be able to create a separate road system, electrical grid, petroleum refineries, internet, and so forth for its armed forces. However, doing so for such major systems that serve both civilian and military needs would be so enormously costly as to be impractical."[80]

The blending of commercial and governmental space capabilities is here to stay, and questions about how to reconcile the conduct of space warfare with the Law of Armed Conflict and the principles of targeting and distinction are important to discuss and debate with respect to hybrid architectures. Policymakers and space strategists will need to consider how best to target military objects and discriminate between commercial and military space systems and infrastructure. In cases where hybrid space architectures are used, this consideration will need to include how to specifically target an adversary's military satellites without negatively affecting commercial capabilities. In cases where hybrid architectures include governmental hosted payloads—referring to the utilization of available capacity on commercial satellites to accommodate additional transponders, instruments, or other space-bound items—military planners and targeteers may need to target a particular military subsystem or capability on a satellite that also includes non-military components and functions.[81] This same idea holds for making distinctions between military and non-military services that utilize the electromagnetic spectrum, such as when jamming and interfering with a rival's satellite communication frequency spectrum used for both military and non-military purposes.

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78 Koplow, 34.

79 Charles Dunlap, as quoted in Amanda Miller, "Resilient Architecture vs. Civilian Risk," *AirandSpaceForces.com* (February 16, 2022), https://www.airandspaceforces.com/article/resilient-architecture-vs-civilian-risk/.

80 Miller, "Resilient Architecture vs. Civilian Risk."

81 Office of Space Commerce, "Category: Hosted Payloads," *Space.Commerce.gov*, accessed June 15, 2025, https://www.space.commerce.gov/category/government-business/hosted-payloads/.

Will Commercial Be There When Needed?

The commercial space sector will play a substantial role in the conduct of military operations and strategy development. This will be because either the commerce enabled by space-relevant technologies is considered a vital national interest that needs to be protected, or because the commercial space sector will provide the means to help achieve a strategy's goals. Presently, the latter seems to be more the case. For many countries, space-based technology, capabilities, and services are interwoven into how their militaries train and fight. Satellite communication, remote sensing, and global positioning services are extensively used during the conduct of normal military operations. While it may be an exaggeration to say some militaries are "dependent" on space-derived services—because militaries often train to the loss of space-enabled capabilities—it is safe to say they have grown more reliant on them.

Because of the dual-use nature of many of the products and services provided by commercial space activities, it will be difficult at times to discriminate between purely military and commercial endeavors and associated systems. There may be shared architectures where military-related communications are enabled by commercial satellites. While there are implications that the strategist must consider, the mixing of military and commercial activities in space is nothing new. Land, sea, and air operations have all had to consider the blending of military and commercial sectors. Space, as well as cyber, will need to consider the means and methods to target and negatively impact commercial activities that may be commingled with military operations to achieve strategic effect.

Will commercial companies be there to support governments in times of war? This is a frequent question among national security analysts. When looking to fully integrate the commercial space sector into an overarching space strategy, this is a question on the minds of many military service members. The short answer to the previous question is "Yes." This question and answer are not unique to the space domain. The aerospace, automotive, and shipbuilding industries have a history of providing military products and services during times of conflict. Unless there are conditions beyond their control, commercial companies will seek to honor the terms of service level or licensing agreements because reneging on contracts would cause the company to lose market share and future revenue. In short, it is bad business not to keep your word. Yet, it must be underscored that commercial companies will support states in times of conflict *if the applicable agreements are in place before the onset of war*.

To ensure that the commercial sector can provide the most benefit in times of conflict, it is necessary that militaries and commercial partners establish trust during

peacetime. Only by establishing trusted relationships and sharing information on commercial products, services, and capabilities can a polity implement a space strategy effectively and in a practical manner.

Occasionally, government or military personnel may presume that commercial partners and their services will not be available during conflict, believing that the commercial space sector's capabilities cannot operate in or withstand a non-permissive or hostile space domain. Such thinking is unfounded. Many commercial space service providers operate in a non-permissive environment every day. Commercial space companies are routinely under cyber-attack, whether by individuals, foreign militaries, or their surrogates. Many commercial space capabilities are more robust and resilient than generally understood by policymakers and warfighters. Commercial satellite operators have become more resilient because of the various threats—jamming of satellite communications or cyber-attacks on networks—they deal with every day. Also, many of the medium-to-large commercial space companies conduct their own research and development to improve how they operate under jamming or cyber-attack conditions, and governments can benefit by applying the lessons learned from commercial partners.

To best incorporate innovative commercial space capabilities, companies and governmental organizations should thoroughly understand certain subjects before conflict occurs. These areas of shared understanding include:

- commercial companies and governmental licensing authorities;
- implications of employing commercial assets to support military activities;
- governments considering the ways and means needed to protect commercial space assets when such assets are employed to support military operations;
- companies and their shareholders considering the implications of providing services to governments during hostilities, such as commercial space assets becoming targets for kinetic or non-kinetic attacks;
- for commercial remote sensing companies, such as those subject to U.S. policies and licensing regulations, understanding the potential level of control that licensing nations may exert during hostilities, including *shutter control*;
- establishing the most effective and efficient communication structure or architecture between governments and commercial partners to enable the unimpeded flow of data information during peace and conflict; and
- ensuring commercial partners have access to all necessary data and information—whether classified or not—to ensure they are able to provide the agreed-upon

products and services during times of war.

Looking Up and Forward

Commercial and quasi-commercial space activities can support the accomplishment of political aims and achieve strategic effect. Certainly, the commercial space sector often will have typical industry-centric concerns, like expanding market share, customer base, and profit margins. Also, governments may look to industry in a traditional manner: enabling a technically educated workforce; increasing gross domestic product; advancing technological innovation; and enhancing national prestige. Even with all these commonly understood roles, commercial entities can also play a key role during competition, crisis, and conflict in the space domain.

Commercial space activities can be beneficial during space warfare for two main reasons: supporting an indirect approach and creating an asymmetric advantage. First, the commercial space sector is an alternate means for coercing others separate from major military forces and actions, which is a fundamental element of the indirect approach. Sponsors and benefactors who are economically well-off can purchase a commercial proxy's capabilities and services to serve policy aims and achieve military objectives. By acting as a proxy or third party, commercial entities can perform a sponsor's bidding to coerce a competitor, which may include deterring a rival from pursuing a certain course of action or compelling a rival to cease a currently ongoing activity. Second, commercial innovation and novel capabilities can create an asymmetric advantage that can be exploited during irregular space warfare. The commercial sector is routinely able to innovate quicker than most governments, thereby rapidly bringing new capabilities and services to market. Because of these benefits, policymakers and military leaders will want to integrate and synchronize commercial space activities with their strategies and operational art of war.

Lastly, commercial entities can operate in a non-traditional or irregular manner, which can make some policymakers uncomfortable because commercial actions may appear to be quasi-governmental or quasi-military in nature. This would be the case of private military companies providing security and military services on behalf of a government sponsor. The blending of governmental and commercial roles and capabilities may raise legal questions regarding how to best discriminate between military and non-military objects during conflict, and these questions must be discussed and debated well before the onset of hostilities.

A key takeaway going forward is that Western leaders and policymakers must consider and have a meaningful dialogue today regarding their respective comfort level and the policy implications of targeting a rival's or third party's commercial capabilities. If Western countries target those commercial capabilities and services providing meaningful military capability to an adversary, the actions may lead to unintended conflict escalation or establishing a normative behavior that runs counter to U.S. and Allied long-term interests.