The Scottish Council on Global Affairs

Commercial Space Systems and Foreign Armed Conflicts

A Scottish Council on Global Affairs Insight

Challenges and ways forward

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About Us

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The Scottish Council on Global Affairs (SCGA) is the first all-Scotland international relations institute providing a hub for collaborative policy-relevant research and a home for informed, non-partisan debate on all areas of international relations and global politics broadly defined.

The Founding Partners are:

- The University of Edinburgh
- The University of Glasgow
- The University of St Andrews

The Council provides a convening space to bring together the public, private and not-for-profit sectors with civil society and academic expertise to encourage dialogue, debate and the dissemination of expertise on issues of global importance.

It looks to forge new relationships and deepen existing ties with universities and civil society in the rest of the United Kingdom as well as with centres of expertise in Europe and across the world.

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Insight Summary

Modern societies are increasingly reliant on satellite-based services that enable critical Earth observation and data transmission services.

Modern societies are increasingly reliant on satellite-based services that enable critical Earth observation and data transmission services. While states continue to compete - and cooperate - in space exploration, space launch the operation of Earth-orbiting satellites are now dominated by private space companies.

Since Russia's full-scale invasion of Ukraine in February 2022, Western space companies have provided vital Earth observation and telecommunications capabilities to support Ukrainian military operations.

This has provided a dramatic illustration of the growing entanglement between commercial and national space systems and the policy dilemmas that emerge when private actors take sides in a war in which their home governments are not formally fighting.

In this light, a recent expert workshop in Edinburgh addressed difficult questions concerning the responsibilities - and potential vulnerabilities - of space companies and governments in times of war.

Does the decision to provide commercial services to one side in an armed conflict render the company's systems and personnel legitimate targets for attack? How can governments leverage commercial capabilities in national security missions while mitigating problematic dependencies? And how should governments seek to protect valuable commercial assets while managing risks of being drawn directly into an armed conflict?

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The rapid growth of commercial satellite systems presents a multitude of opportunities as well as challenges for governments...

03 Key Findings

The rapid growth of commercial satellite systems presents a multitude of opportunities as well as challenges for governments. The Edinburgh workshop identified a series of key trends that require further research and policy deliberation:

1. Private companies have supported national space programs since the dawn of the Space Age. Recently, however, there has been a notable expansion in the range and scale of commercial space involvement in national security missions for established space powers and emerging spacefaring nations. This now includes commercial support for one side in an armed conflict where the companies' home states are not officially parties to the armed conflict. Western support for Ukraine during Russia's illegal invasion is the key test case for this development.

2. There are benefits and potential drawbacks to utilising commercial space systems to support allies or partners in a foreign armed conflict. Commercial capabilities allow Western governments to avoid committing their own sensitive intelligence and military space assets, which may reduce the prospect of inadvertent escalation. Yet a company could provide services without the knowledge and authorisation of its home state and in so doing, may undermine foreign policy objectives and risk inadvertently drawing states into direct conflict.

3. The use of commercial space systems to augment or replace national security capabilities blurs the line between combatants and non-combatants and raises the prospect that commercial operators may be targeted during an armed conflict.

Key Findings (contd.)

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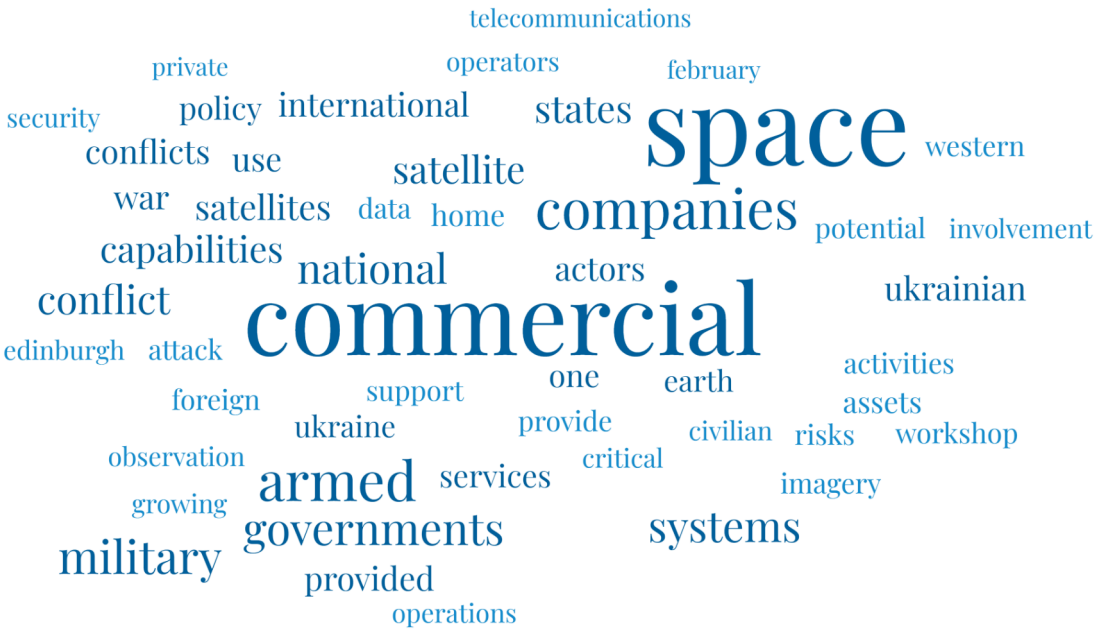
4. Reliance on commercial services can also generate dependencies that provide space companies with forms of economic and political influence.

5. Commercial operators, governments, and intergovernmental bodies need to proactively pursue creative approaches to protect valuable commercial capabilities while managing risks of conflict escalation. These may include improved technological resiliency, enhanced oversight and regulation, and measures to compensate companies for losses incurred during authorised commercial contracts. Yet there are no easy solutions, and any initiative will come with inherent trade-offs and potential drawbacks.



Introduction

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Earth-orbiting satellites mediate all aspects of modern life, enabling everything from global navigation and banking to environmental monitoring and advanced warfare. These space systems—satellites, ground stations, and the data links between them—have expanded rapidly in recent years, largely driven by a growing transnational commercial industry.

Ensuring access to, and use of, Earth orbital space is now recognised as a key component of national defence and prosperity. The United Kingdom and Scottish governments have acknowledged the need for sustained public-private collaboration including through the coordination of targeted investments in advanced technologies and skills training. There are now more than 130 space companies based in Scotland, working in critical areas including space launch (rockets and ground facilities), fabrication of satellites and components, and downstream data analytics.

While space systems provide global benefits, the so-called "New Space" era poses important challenges for policymakers. The rapid growth in rocket launches and satellites has generated fundamental sustainability problems. These include congestion in low-Earth orbit, increased debris and heightened risk of collisions, competition for radiofrequency spectrum, interference with astronomy and indigenous knowledge systems, and contributions to terrestrial and atmospheric pollution and climate change.

04. Introduction (contd.)

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A further challenge concerns the increasing use of commercial space technologies in armed conflicts, especially where the companies' home states are not directly involved in the fighting. This has been most dramatically demonstrated during Russia's full-scale invasion of Ukraine since February 2022, where Western space companies have provided vital Earth observation and telecommunications capabilities to support Ukrainian military operations.

The growing entanglement between commercial and national space systems has in turn raised difficult questions concerning the responsibilities—and potential vulnerabilities—of space companies and their home governments in times of war.

These issues require creative engagement combining innovative academic thinking and diverse forms of policy experience. On 13-14 July 2023, the Centre for Global Law and Governance at the University of St Andrews and the Outer Space Institute convened an international expert workshop in Edinburgh to address the technical, legal, political, and strategic challenges—and opportunities—presented by growing commercial space involvement in foreign armed conflicts.

The workshop was organised and hosted by Dr Adam Bower (University of St Andrews) and Professor Michael Byers and Professor Aaron Boley (University of British Columbia and OSI co-directors). Funding was generously provided by the Department of National Defence Canada's Mobilising Insights for National Defence (MINDS) program and the Scottish Council on Global Affairs, with additional logistical support from the Edinburgh Climate Change Institute at the University of Edinburgh.

This workshop was part of a series of events initiated by the OSI that bring together leading thinkers and practitioners to address critical challenges posed by outer space activities. Invited participants representing academia, government, and policymaking communities met over two days of intensive discussions. In recognition of the complex and transdisciplinary nature of the issues, the workshop drew on expertise from the fields of astronomy and physics, aerospace engineering, international law, international relations, UK politics, diplomacy, and military affairs. The discussions focused on a series of current and future policy challenges requiring further cutting-edge research.

05. Areas of Current Concern and Potential Policy Development

Drawing lessons from commercial activities in the Russia-Ukraine war

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Private space companies have made important contributions to national space programs in the West since the dawn of the Space Age. This includes the provision of Earth imagery and satellite communications in armed conflicts as far back as the Vietnam War but accelerating with the Gulf War and US and allied operations in Afghanistan and Iraq. Despite these continuities, the current situation is characterised by two trends which suggest a transformed context. On the one hand, there has been a rapid expansion in the range and scale of commercial space involvement in national security both within established space powers and in emerging spacefaring nations. On the other hand, this now includes commercial activity to support one side in a foreign armed conflict, where the companies' home states are not officially at war.

These trends have become most apparent during Russia's ongoing invasion of Ukraine where commercially owned and operated satellites have been used to great effect in enabling and enhancing Ukrainian military operations.

For example, Canadian company MDA and ICEYE from Finland have provided synthetic aperture radar (SAR) imagery (which can "see" through cloud cover and at night) through arrangements with the Canadian government and a Ukrainian philanthropic organisation. US companies including BlackSky, Maxar, and Planet have provided vast amounts of optical imagery to Ukraine via international aid packages and long-term contracts with US intelligence agencies (who in turn share imagery with Ukrainian partners). This imagery is used for reconnaissance and targeting of Russian military formations and infrastructure. Some is also released to news agencies and non-governmental organisations, which has aided public understanding of the conflict and may be used as evidence in future war crimes trials. Additionally, Elon Musk's SpaceX Starlink satellite internet constellation has provided the Ukrainian military with a vital communications platform in addition to supporting civilian applications for the Ukrainian government and society.

06. Entanglement between commercial and military space systems

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This growing use of commercial space systems to augment or even replace national security capabilities makes it harder to distinguish between civilian and military activities. This is especially challenging as most space technologies are inherently dual-use.

For example, a single satellite may handle both civilian and military communications traffic and an observer may not be able to determine the end-user at a given moment in time. Similarly, Earth observation data (such as optical or SAR imagery) can be used to document environmental change or human rights abuses or identify military forces in the field. This complicates questions of status and responsibility as noted below.

The deliberate use of commercial space systems to support allies or partners in a foreign armed conflict holds some possibly contradictory implications. On the one hand, relying on commercial capabilities can allow Western governments to avoid committing their own sensitive intelligence and military space assets. This provides a politically beneficial buffer for states keen to avoid becoming a direct participant in hostilities. In other words, engaging commercial capabilities can be salutary in managing relations during times of heightened hostility. Neither the Russian Federation nor the United States and its NATO allies wish to be drawn into a direct armed conflict with the other and, despite some florid rhetoric from the former, both sides are taking great pains to avoid escalation.

On the other hand, states do not maintain continuous oversight of commercial space assets. The examples noted above presumably required governmental approval, which was indeed publicly acknowledged in some cases. Yet it is at least conceivable that a space company could act without the clear knowledge and authorisation of its home state and in so doing, may undermine foreign policy and risk inadvertently drawing states into direct conflict.

At the same time, the reliance on commercial services can generate dependencies that provide space companies with forms of economic and political influence. In one prominent example, Elon Musk has previously threatened to stop Starlink coverage over Ukraine due to the allegedly high costs being borne by SpaceX, which caused considerable concern in Kyiv and Washington.

07. Risks

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The use of commercial space systems for critical military and intelligence capabilities during an armed conflict thus blurs the line between combatants and non-combatants and raises the prospect that commercial operators may be targeted.

Civilian actors and assets would normally be protected from attack under the law of armed conflict (international humanitarian law). However, this protection is forfeited if an actor or object "by their nature, location, purpose or use make an effective contribution to military action and whose total or partial destruction, capture or neutralization... offers a definite military advantage."

Such a judgement inherently depends on the specific context and the potentially lawful targeting of a civilian satellite or ground station would still be governed by legal principles of distinction and proportionality. But the bottom line is that space companies that aide one side in an armed conflict may open themselves up to potential attack.

Indeed, Russian diplomats have warned against commercial space involvement in military operations and declared that "quasi-civilian infrastructure may be a legitimate target for a retaliatory strike." While Russia has not acknowledged specific efforts, we already have examples of hostile attacks that have been attributed to actors associated with the Russian state.

07. Risks (contd.)

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On 24 February 2022, satellite broadband internet operator Viasat experienced a major cyberattack against its KA-SAT satellite network which permanently disabled thousands of customer modems in Ukraine and Europe. SpaceX has also reported regular attempted cyberattacks against its Starlink broadband internet constellation operating over Ukrainian territory.

These episodes highlight the very real risks to space companies, their employees, and their infrastructure posed by cyberattacks and other forms of malicious interference. Concerns for physical safety and/or financial prospects may compel commercial actors to withdraw or modify services, as with SpaceX's decision in February 2023 to try and limit the Ukrainian armed forces' use of Starlink for "offensive" military purposes.

There are also risks to other spacefaring actors and the international community more broadly. Attacks and interference against commercial space systems have thus far not permanently disabled or destroyed satellites themselves. Yet a cyberattack could turn a satellite into a piece of inoperable space junk.

More seriously, the use of a ground-based ballistic missile to destroy a satellite would create thousands of pieces of long-lived debris, much of it too small to be detected, which would increase the risk of collisions and make highly utilised zones of low-Earth orbit more dangerous for operators of the very systems on which we have become so dependent. Russia's deliberate destruction of one of its own defunct satellites in November 2021 is a dramatic example of the dangers associated with the testing and potential hostile use of anti-satellite weapons.

The negative consequences of attacks against satellites may perversely increase the incentives to strike against Earth-based infrastructure, such as satellite ground stations and the subsea cables which transport telecommunications data around the world. This too is not a hypothetical concern, as the severing of a major subsea cable near Svalbard Island in early January 2022 demonstrates.

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08. Responsibilities & ensuring adequate regulation

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Responsibilities

Integrating civilian commercial technologies into defence systems thus raises challenging questions concerning the responsibilities of commercial actors – and their home states. The assessment of a business case would have to take into account the possible risks to company assets and personnel. These are also policy dilemmas that governments must weigh.

Should Western governments offer protection (whether publicly or privately) to satellite companies that provide support to states involved in armed conflicts, whether through physical measures or retrospective compensation for loss? More fundamentally, would it ever be appropriate for a government to declare that it would regard an attack on a commercial satellite as an attack on the state itself, potentially triggering a right of self-defence?

Ensuring adequate regulation

In light of the above, there is a clear need for new and creative mechanisms to effectively govern commercial space actors' contributions to national security, especially in the context of foreign armed conflicts. Domestic regulation is clearly part of the response and could take a variety of forms including more rigorous rules concerning what kinds of commercial capabilities may be provided, to whom, and in what circumstances.

For example, Western governments may consider new legislation to restrict the provision of commercial satellite imagery and telecommunications to foreign states involved in armed conflicts, especially where the recipients are not part of the same political and military alliances (Five Eyes and NATO). This becomes more challenging, however, in the context of multinational companies which may have foreign subsidiaries and/or seek to transfer data via intermediaries. As such, enhanced transparency and monitoring of these commercial activities will also be necessary.

08. Ensuring adequate regulation (contd.)

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Commitments to indemnify commercial operators against losses incurred as a result of government-authorised uses of their assets during an armed conflict could provide helpful reassurance. Yet such commitments would be financially costly and could risk drawing governments further into armed conflicts.

Other responses, such as declaring some commercial space capabilities to be "critical national infrastructure" or regarding targeting of commercial assets to be akin to an armed attack may be counterproductive if they reduce the room for diplomatic manoeuvre in a crisis and increase the prospect of unwanted escalation.

International insurance companies could conceivably play a role, most likely by refusing to insure commercial activities that are judged to be excessively risky. This could in turn have a chilling effect on commercial involvement in ongoing armed conflicts. Yet even if pursued, this may ultimately have only a limited impact as most satellite operators do not carry insurance throughout their satellites' lifespan but only for the initial launch and deployment.

Finally, there are also opportunities to push for new international standards, norms, and rules which may extend to commercial actors in some instances. The current United Nations Open-Ended Working Group on Reducing Space Threats (OEWG) is one such venue.

The OEWG, which was created though a UK-led initiative, is mainly concerned with developing common understandings of threatening and responsible and irresponsible behaviour among states, as the basis for agreeing new norms and, potentially, legally binding rules.

Yet the role of commercial space actors is undeniably relevant to these deliberations and space companies have featured in some discussions. The OEWG's final meeting takes place at the end of August 2023, and will hopefully serve as the platform for further diplomatic efforts.

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09. Conclusions

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Future armed conflicts are likely to feature extensive involvement of commercial space systems. In Ukraine, Western space companies are supporting a close partner of their home governments. Yet the ongoing proliferation of space technologies means that the range of commercial activities will continue to expand, possibly in ways that complicate or directly challenge government objectives. For this reason, policymakers and industry leaders need to think carefully now about how to manage the benefits and downsides of commercial involvement in national security missions and their use during armed conflicts.

The Edinburgh workshop identified a range of issues that require further academic research and policy deliberation. The broader takeaway is that commercial operators will need to be part of the discussion and integrated into policy development at national and international levels. This cuts against traditional modes of international diplomacy among states. Yet the nature of space activities requires bold and creative approaches to manage this rapidly changing domain.

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