Journal & Proceedings of the Royal Society of New South Wales, vol. 153, part 1, 2020, pp. 83–86. ISSN 0035-9173/20/010083-04

Military and geopolitical challenges in space

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My[1] duty here today is to talk about the 5% of the time that we think maybe space won't work. It's a pleasure to be here this morning in such esteemed company, but especially can I say welcome to the undergrads in the room. Some of the challenges we're going to talk about today are yours and mine to solve over the next few years.[2]

I have some initial thoughts on where we are in a military and geopolitical context and how we got here, and the direction that some loud voices are moving in. And highlight some of the tools that we might think about as we decide what being a responsible space player looks like for Australia and move forwards in that direction.

So Her Excellency, the Governor, mentioned that space is becoming more militarised. Since the motto of the Royal Society is to question everything, I want to think about that. Is space more militarised? There's certainly more military stuff in space. But there's a lot more of everything in space today then there was 50 years ago. So this quote[3] wouldn't have been out of place in Mike Pence's speech at the International Astronautics Congress (IAC) in 2019, but it's actually a little bit older than that. And Kerrie highlighted some of the roots of different country's space programs and humanity's progress in space, it sort of stems from a lot of strategic competition and from defence purposes. James Doolittle was one of the earliest thinkers on that topic back in 1958. But I think that it's important to consider that that rhetoric wouldn't be out of place today. So I'm not sure if space is more militarised today or if space is just bigger. It has always been a place for strategic competition between nations since Sputnik 1 in 1957. There was an element of strategic competition between the great powers at the time.

As the commercial ecosystem in space has grown, public knowledge around what happens in that domain and what's going on there has grown. I think we are more conscious today of some of the military and geopolitical aspects of the space domain. And strategic competition has upsides. We wouldn't have some of the technologies we have today, like GPS or some of the Earth observation technologies, without those technologies first finding a purpose in defence and strategic competition. If we didn't have Earth observation, we wouldn't have found out about climate change.

1 The following opinions and analysis are my own and do not reflect the official position of the Department of Defence, the University of New South Wales or the Institute for Regional Security.

2 This is an edited version of the transcript of Dr Piggott's talk.

3 "We, the United States of America, can be first. If we do not expend the thought, the effort, and the money required, then another and more progressive nation will. They will dominate space, and they will dominate the world" — James Doolittle, 1958. (James Doolittle led the eponymous Dolittle raid, and subsequently worked in the US space program in its infancy. He was a contemporary of Goddard's and von Braun's.)

A few people have touched on strategy and what it means to be strategic. And what I am going to talk about now is what that looks like for some of the major powers. But first I think it's important to talk about what strategy actually is. Because it's not about winning.[4] It's about attaining continuous advantage, and when we see something like space, which is a limited resource, we often see competition for that resource between different groups of people. So it's important to remember that we're not talking about a particular end state, we're talking about planning for continuous advantage. What does that mean to a few different countries?

We have heard some rhetoric that most of you will be familiar with from the Vice President of the United States at the IAC. I think that what Space Command said is sort of a little bit more moderate in terms of their outlook,[5] but there's a range of opinions in the United States, from an America First sort of point of view to a more moderate point of view that recognises the importance of space to all of those national enterprises, to a realm for competition between the United States and other great powers. So I think that quote's really powerful in being a 2019 version of what General Doolittle was talking about back in the '50s.

The idea of space force is not as new as Donald Trump. That idea has its genesis in some law-makers in the United States before he appeared from some people who were unhappy with how the US Air Force managed space capability development. Mike Pence has directed NASA to return to the Moon by 2024 and some of the people that I've spoken to in NASA see that timeframe as a bit challenging. To wrap all that together at IAC we saw a real tension between different parts of the American leadership between what American dominance looks like and what role there is for international partners in the role for the United States and space. Jim Bridenstine, the NASA Administrator, spoke about the importance of international partnerships. So there's a real lesson there about — that's peculiar to the United States in terms of what people at the working level think about international collaboration.

Russia's another country that's reorganised its defence apparatus to better leverage the space domain. There are a couple of quotes from Russian Military doctrine, that's a little bit long in the tooth now and some more recent comments from the Defence Minister.[6] So they've gone the opposite direction from a space force. They've wrapped some of their space elements up with some other air defence assets because they see some synergies there that are going to help them better secure space for Russia. I think it's important to highlight that the Russian Military sees warfare as a contest for information over a number of domains without often clear boundaries, which is a little bit different from speaking about space as a war fighting domain. So there are some differences in approach between

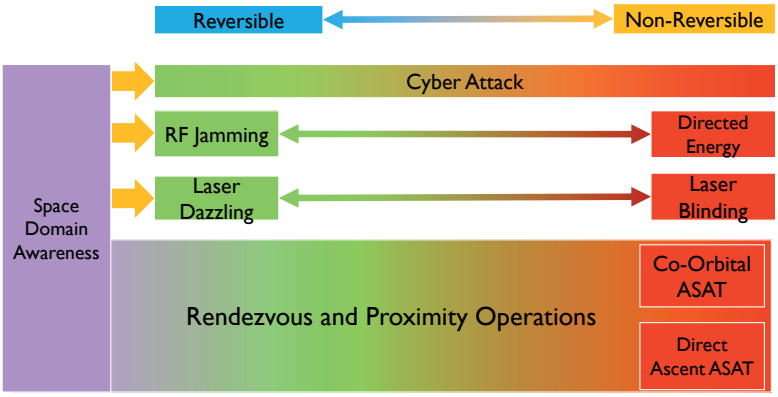
4 "Strategy is not about winning … Strategy, in its simplest form, is a plan for attaining continuing advantage" — Everett Dolman, 2004.

5 "The U.S. must recognize that space will be a major engine of national political, economic, and military power for whichever nations best organize and operate to exploit that potential." — USAF Space Command, 2019.

6 "The securing of supremacy on land, at sea, and in the air and outer space will become decisive factors in achieving objectives" — Russian Military Doctrine, 2010. And "[There has been a] shift in the combat centre of gravity towards the aerospace theatre" — Sergei Shoigu (Russian Defence Minister), 2015.

Russia and the United States, and you can see how they're organising for best effect.

When we talk about whether space force is a good thing, whether it's ethical, what the implications are there, I think it's important to remember that there are other ways of organising that are maybe not so bombastic, that we need to give equal consideration to.



Finally, China. Chinese strategic writing emphasises that space is essential to operating in the other domains, and the same report from US Air Force Space Command is explicit about calling out China and their long-term strategy for displacing the United States.[7] The Chinese Academy of Military Sciences talks about fighting a quick war as one of the characteristics of space operations and they see that as essential to their ability to deter their adversaries geopolitically.[8] The People's Liberation Army, of course, has organised a strategic support force that wraps up space, cyber and electronic warfare capabilities in the People's Liberation Army. So it's a third, different again example of a Military space organisation.

So I will leave you with Figure 1 where I'm going to talk about some of the actual tools and systems that give Steven and me pause when we think about what people can do in space. Space domain awareness on the left-hand side does what it says on the tin, that's understanding what's happening in space, where spacecraft are, what they're doing. Without that, you can't achieve any of those other effects if space turns into a war-fighting domain, that you can see over on the right-hand side. So the first thing I want to talk about is cyberattacks. I'm not a cyber expert, but I don't think it's news to anyone that spacecraft and ground stations are vulnerable to cyber effects. The second thing is a sort of spectrum from radio frequency jamming to directed energy weapons. We see in the public domain that the Defence Intelligence Agency commented this year on some Chinese satellite communication jammers over a range of fre-

7 "China is executing a long-term strategy with the explicit aim of displacing the U.S. as the leading space power" — USAF Space Command, 2019.

8 "Whoever controls space controls the Earth" — China's Academy of Military Sciences, 2013.

quency bands. And it won't be news to any of you that those are frequency bands that are pretty commonly used across the military and civilian sectors. We also see from the Defence Intelligence Agency that GPS jammers have been deployed in the Spratly Islands and the Chinese have published scientific papers on laser blinding techniques and successfully did that against one of their own satellites in 2013.

That brings me to my second point. There's another spectrum there between laser dazzling and laser blinding. We're talking about a spectrum from reversible to non-reversible effects here. So the same laser that you can use at a lower power setting to dazzle a satellite, you can amp up the power and burn out the charge-coupled device (CCD) camera.

Finally I want to talk about rendezvous-and-proximity operations. That bleeds into space domain awareness because all three of those countries have demonstrated rendezvous-and-proximity operations programs. That's about driving satellites around in orbit to go and check out other satellites and see what they're doing. There are a number of applications for that from intelligence to verifying arms control treaties, to removing debris in space. Having that capability is essential to all of those things, and not all of those are military purposes.

The two final points on Figure are about co-orbital anti-satellite weapons and direct-ascent anti-satellite weapons. If you can do rendezvous and proximity operations, there's no reason you can't put bombs on satellites and drive them around in orbit.

And we've seen direct-ascent, anti-satellite (ASAT) tests from, most recently, India, but also China, Russia and the United States. And if anyone's looking for more information on any of those things, two reports from the Center for Strategic and Independent Studies[9] and our friends at the Secure World Foundation are excellent resources to get more awareness about that.

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9 Harrison, Johnson, and Roberts, 2019, and Weeden and Samson, 2019.