

Snapshot – Space and the Netherlands

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Space security is on the strategic agenda for 2019, most overtly with Donald Trump’s [Space Policy Directive-4](#) (SPD-4) in February calling for the “establishment of the United States Space Force.”¹ This snapshot aims to dissect the importance of space technologies today and to outline the proximate context of potential threats posed in space. We will make the case for the Netherlands playing an increased role in global space activities while outlining their capacity and means to do so.

Importance of Space in Everyday Life

In our world today, space assets are vital to daily living. In 2016, General John Hyten, then Commander, Air Force Space Command, stated “there [can be] no such thing as a day without space.”² Capabilities in space affect a wide and ever-growing list of activities, such as business transactions and weather predictions. Satellites are the most important space asset, with around “6-7% of GDP in Western countries, i.e. € 800 billion in the European Union, dependent on satellite radio navigation.”³ They also ensure time synchronicity between linked networks. Without this, the outcome is likely to be an “emergency situation” as eleven out of sixteen critical industries are dependent on precision timing, from communications to power distribution.⁴



Figure 1: Percentage breakdown (68.75%) of critical infrastructure sectors which depend on satellites for precision timing. Source: <https://www.dhs.gov/cisa/critical-infrastructure-sectors>.

Satellites are therefore vital in the hyper-connected developed world, and disruption “would affect Western countries disproportionately given their greater reliance” on space services.⁵ However, space activities are also “increasingly vital to meeting... development needs” relating to water resource management and climate change responses, according to a Malawi representative at the UN, who used the example of satellite images to enable the planning of evacuation routes during flooding in their country.⁶ Furthermore, satellites are integral for precision agriculture, a practice that can be used to improve global food security as the population swells and greater efficiency in farming is required,⁷ meaning space technology is increasingly important to the developing world.⁸

Importance of Space for Military Purposes

Space assets are therefore very important for daily civilian life and human security. They are also crucial to security and defense. The U.S. Director of National Intelligence, Daniel R. Coats, says “(States will) become more reliant on space services for... military needs,” particularly in detecting and countering nuclear or missile threats.⁹ The 2019 US Missile Defense Review similarly argues that the “exploitation of space” for missile defense is necessary to prepare for both “known and unanticipated threats,” using the example of spacebased sensors which can monitor, detect, and track missile launches from almost anywhere on the globe. In the current climate of heightening interstate military competition, this is a key defense issue.

There is growing concern that the increasing importance of satellites for military applications could make them targets in future conflicts: “crossdomain threats are especially likely. These can include kinetic or cyber-attacks on ground-based infrastructure (e.g., satellite ground control stations)... [or] attacks on spacebased equipment (e.g., GPS navigation satellites, communications satellites).”¹⁰ This threat was most recently demonstrated by India as in March 2019 they shot down a low orbit satellite.¹¹ Russia¹² and China¹³ also have anti-satellite weaponry available for use during a potential future conflict. Furthermore, Coats says a “particular concern” is that “[s]ome technologies with peaceful applications—such as satellite inspection,

refueling, and repair—can also be used against adversary spacecraft.”¹⁴ This makes it clear that space is likely to increasingly be a sphere utilized and targeted for military purposes, and as spacecraft can be dual-purpose, it is a threat that is difficult to anticipate.

The Civil-Military Nexus

This demonstrates that threats are emerging in space, making this sphere of military importance. Furthermore, the importance of space for many industries is drawing private companies into space. Their large budgets are proliferating strong knowledge and expertise, and states are now tapping into this for military gains. This is best exemplified by the competition between Jeff Bezos’s Blue Origin rocket company, who recently [won a \\$500-million government contract](#) to develop its New Glenn rocket to launch military satellites for the US government, and Elon Musk’s SpaceX, the current provider.¹⁵ Their ongoing competition over space launch, coupled with the fact that “the U.S. Air Force is looking at how private companies might fill the military’s satcom needs,”¹⁶ demonstrates the merging of the military-commercial sector(s), and is evidence of how space is becoming an increasingly competitive domain.

The Commercial Space Industry

Besides increased competition, another consequence of this development is the congestion of space, as what was once a sphere of influence exclusive to states contains more non-state, commercial assets. On top of competing for military contracts, the private sector is vastly increasing its profit-making activities in space; the global space sector is “one of the fastest-growing industries in the global economy, worth around \$350 billion in 2015 and estimated to grow to \$640 billion by 2030.” This now dwarfs investment by nation-states as “76 per cent of global revenue in the space sector is now generated by commercial activities.”¹⁷ These activities will soon include space mining¹⁸ and space tourism.¹⁹ Commercial companies will also facilitate their work through “mega-constellations” which will dramatically increase the total number of satellites in space.²⁰ The outcome of the rise in development of military space capabilities and commercial space activities is that space is an “increasingly competitive, congested and contested environment.”²¹

A (potential) threat due to increased space congestion is that it inevitably heightens the chances of space debris due to unintended collisions. This would have a rapid cumulative effect, as outlined by Kessler’s domino theory,²² and a worst-case scenario that saw several satellites damaged or destroyed would have results “equivalent to that of a nuclear war.”²³ This drives home that the destabilization of satellites, whether directly as an act of warfare or indirectly due to unforeseen miscalculations, would be an important security issue.

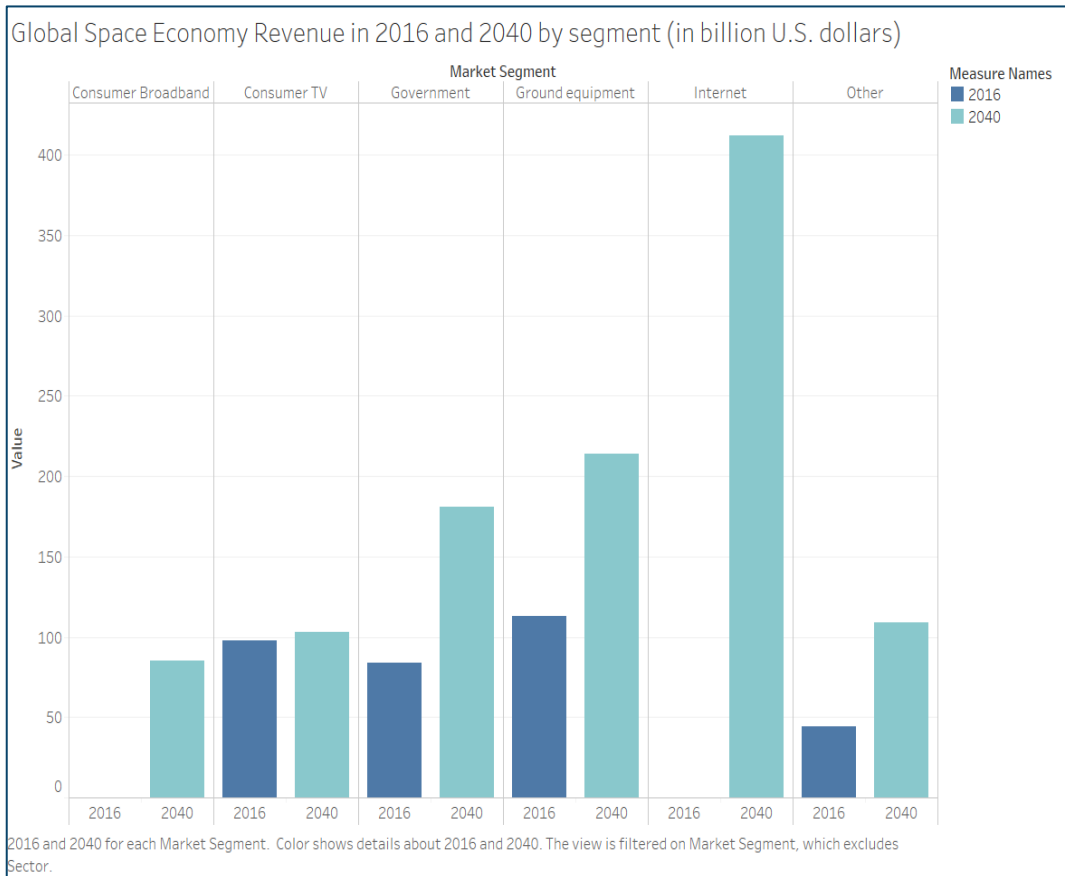


Figure 2: The revenue of the global space economy in 2016 and prediction for 2040, broken down by segment. Source: statista.com (October 2017).

What Does This Mean for the Netherlands?

Having articulated the importance and value of space, we now present the opportunities that arise for the Netherlands due to this ever-increasing importance. The main opportunity lies in the facilities already present in the country. Firstly, the Netherlands public space sector, governed by the cross-government Netherlands Space Office (NSO), is a great starting point for multi-stakeholder collaboration and increased commercial participation. Furthermore, the Netherlands is host to the European Space Agency (ESA) in Noordwijk; the benefit of this was cited by a Dutch developer of CubeSats²⁴, who said “[t]he fact that we’re able to test out satellites in a chamber... just half an hour from our base, is extremely valuable.”²⁵ These facilities led Franco Ongaro, the ESA’s Director, to declare the province of Zuid-Holland the “space valley of Europe.”²⁶ These already-existing facilities therefore present a significant opportunity for the Netherlands to be a strong performer in an ever-growing and ever-more-important sphere. As a middle power that ‘punches above its weight’²⁷ this would be a fitting way for the Netherlands to be a key figure in the (post-Brexit) EU, and to project power and influence abroad because of this.

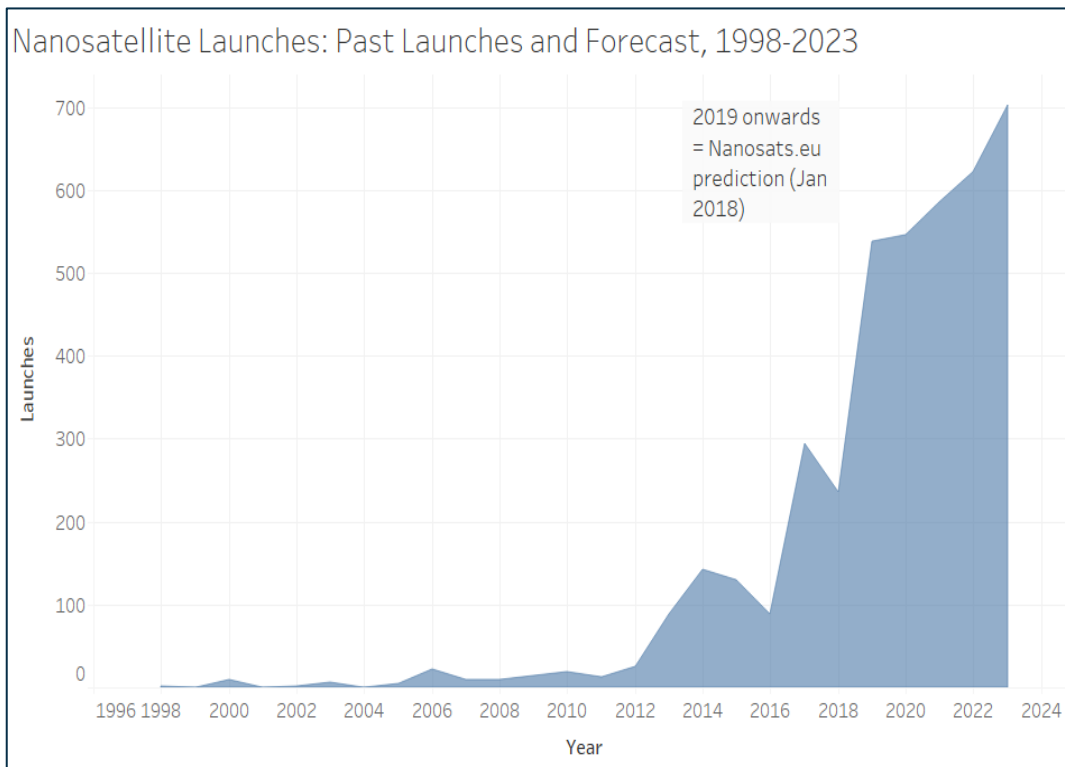


Figure 3: Nanosatellite launches, based on past launches, scheduled launches, and prediction, 1996-2023. Source: Erik Kalu, Nanosatellite & CubeSat Database, nanosats.eu.²⁸

An opportunity for the Dutch commercial sector to better utilize these facilities is also presented in the next long-term EU budget 2021-2027, in which the EU Commission is proposing to devote €16 billion for “[f]ostering a strong and innovative space industry: The new space programme will improve access for space start-ups to risk finance.”²⁹ The Netherlands has both start-up and world-leading companies which could benefit from this, particularly in nano and cube satellite building, which will be increasingly in demand as Fig. 3 shows above.³⁰

In the military sphere, space has become important as a means of situational awareness, but also a threat because of opponents’ (potential) use of space. Both chances and threats can only be fully be exploited and countered through thorough and swift collaboration amongst all space players in the Netherlands. These developments have led to the following recommendations relating to space activity for the Netherlands. The first two present upstream market opportunities which will require some foresight from the civil sector in order to best utilize the Netherland’s resources. The third recommendation looks at a downstream opportunity to build upon an already existing market. Finally, the last two conclusions will argue for military leverage of civil knowledge and resources in the Netherlands:

- The facilities at the NSO and the ESA coupled with the European Commission’s pledge to fund space activities, as outlined above, represent opportunities that should be utilized by the Dutch commercial sector.
- Next to the Netherlands being home to innovative satellite manufacturers, they have also co-manufactured Europe’s satellite launch vehicles.³¹ Development and launch of satellites are the first two stages of the “space value chain,” and value is added at each stage of the chain.³² This is an opportunity for the commercial sector to provide further space services as the two foundational stages are already present.

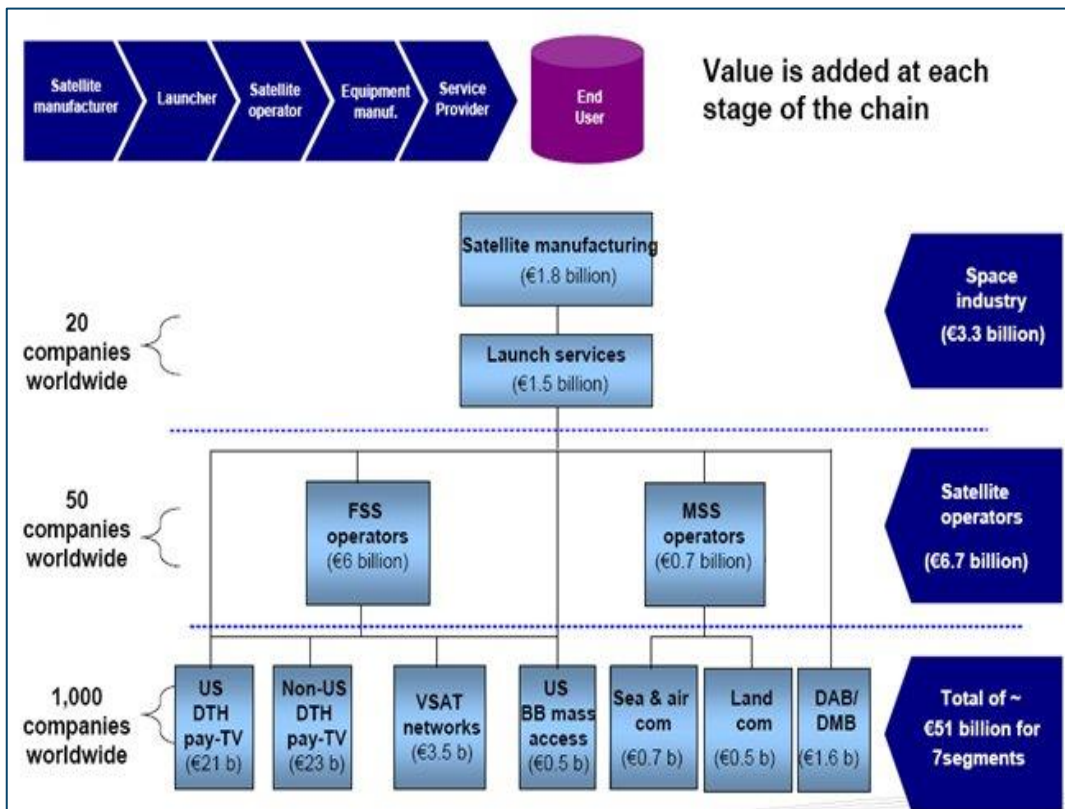


Figure 4: The Space Value Chain. – Credits: ESOA (European Satellite Operators’ Association). Retrieved from: <http://www.spacesafetymagazine.com/space-on-earth/space-economy/>.

- The Dutch are market leaders in the field of precision agriculture by the use of satellites, for which demand will only be growing. A satellite data portal for this purpose³³ has been built, as well as ‘Tropomi,’ which measures air quality and climate for the ESA.³⁴ All the knowledge and tools are there, and so rolling out precision farming technology to foreign markets, and advancing climate research, should be focal points for the Dutch commercial sector moving forward. This will benefit the Dutch economy, while also working toward cleaner and more efficient development worldwide.
- The knowledge and technology as outlined above should be tapped into by Dutch Defense. The Brik-II³⁵ is a start, and will be launched this year by the Royal

Netherlands Air Force, but more can be done. As the Brik-II will only last three years, in the future a mega-constellation could be created, providing consistent and more wide-spread monitoring and enabling satellites to be replaced so the constellation can be maintained. This would increase Dutch independence in the space domain and foster resilience if other satellites are compromised, whether as an act of war or by accident (eg. space debris).

- A final recommendation is for the inclusion of MoD at the NSO; we hope to have shown how space could easily become a security issue, so greater multi-stakeholder collaboration is a fitting way to keep abreast of this.

In conclusion, this snapshot has identified why space is a vital domain for both civilian and military life. Due to this importance and the proliferation of space accessibility, the commercial and military sectors are becoming increasingly intertwined in relation to space activities. This presents a significant opportunity for both of these sectors in the Netherlands, as our concluding recommendations have demonstrated.

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Endnotes

¹ Kaitlyn Johnson, *How Does Space Policy Directive-4 Reorganize U.S. Military Space Operations?* (Washington D.C.: Center for Strategic and International Studies, 2019), <https://aerospace.csis.org/how-does-space-policy-directive-4-reorganize-u-s-military-space-operations/>

² Elizabeth Quintana (2017) The New Space Age, *The RUSI Journal*, 162:3, 88-109, DOI: 10.1080/03071847.2017.1352377

³ US MISSILE DEFENCE REVIEW 2019, https://www.defense.gov/Portals/1/Interactive/2018/11-2019-Missile-Defense-Review/The%202019%20MDR_Executive%20Summary.pdf

⁴ Linda Dawson. War in Space: The Science and Technology Behind Our Next Theater of Conflict

⁵ Gaub, Florence. “What If...? Scanning the Horizon: 12 Scenarios for 2021 | European Union Institute for Security Studies,” January 25, 2019. <https://www.iss.europa.eu/content/what-if-scanning-horizon-12-scenarios-2021>.

⁶ UN, Raising Alarm over Possible Space Wars, First Committee Delegates Explore Ways to Build New Order for Preventing Celestial Conflict, Confrontation | Meetings Coverage and Press Releases, 24 October, 2018. <https://www.un.org/press/en/2018/gadis3609.doc.htm>

⁷ White, Jason C., and Jorge Gardea-Torresdey. “Achieving Food Security through the Very Small.” *Nature Nanotechnology* 13, no. 8 (August 2018). <https://doi.org/10.1038/s41565-018-0223-y>.

⁸ For more (Dutch language) information on the importance of earth observation: Frank Bekkers, Folder Belang en Toepassing van Aardobservatie | HCSS, December 8th 2017, <https://www.hcss.nl/report/folder-belang-en-toepassing-van-aardobservatie>; Frank Bekkers, Folder Aardobservatie en Veiligheid | HCSS, December 8th 2017, <https://www.hcss.nl/report/folder-aardobservatie-en-veiligheid>; Frank Bekkers, Folder Aardobservatie, Voedsel, Klimaat en Biodiversiteit | HCSS, December 8th 2017, <https://www.hcss.nl/report/folder-aardobservatie-voedsel-klimaat-en-biodiversiteit>.

⁹ Coats, Daniel R. “Statement for the Record: Worldwide Threat Assessment of the US Intelligence Community 2019,” January 29, 2019. <https://www.hsdl.org/?abstract&did=>

¹⁰ Gabriel, R., and B. Koven. “Malicious Non-State Actors and Contested Space Operations | NSI,” 2018. <https://nsiteam.com/malicious-non-state-actors-and-contested-space-operations/>.

¹¹ Sriram Iyer and Ruqayyah Moynihan. India enters an elite space club after scientists shoot down a low-orbit satellite 300km away in space, says Prime Minister Modi. March 27 2019.

https://www.businessinsider.com/scientists-in-india-just-shot-down-a-low-orbit-satellite-in-space-2019-3?r=US&IR=T&utm_content=buffer19ce7&utm_medium=social&utm_source=facebook.com&utm_campaign=buffer-bi

¹² Sheetz, Amanda Macias, Michael. “Russia Succeeds in Mobile Anti-Satellite Missile Test: US Intelligence Report,” January 18, 2019. <https://www.cnbc.com/2019/01/18/russia-succeeds-in-mobile-anti-satellite-missile-test-us-intelligence-report.html>.

¹³ Zisis, Carin. “China’s Anti-Satellite Test.” Council on Foreign Relations, February 22, 2007. <https://www.cfr.org/backgrounder/chinas-anti-satellite-test>.

¹⁴ Coats. Statement for the Record: Worldwide Threat Assessment of the US Intelligence Community 2019

¹⁵ Fernholz. Jeff Bezos says space isn't a race. We're not so sure.

<https://qz.com/1424983/jeff-bezos-says-blue-origin-isnt-in-a-race-with-elon-musks-spacex/>

¹⁶ Tucker. The Military Race for Space Will Turn on the Ability to Choose Commercial Services. <https://www.defenseone.com/technology/2018/03/military-race-space-will-turn-ability-choose-commercial-services/146675/>

¹⁷ Elizabeth Quintana (2017) The New Space Age, The RUSI Journal, 162:3, 88-109, DOI: 10.1080/03071847.2017.1352377

¹⁸ “[M]ining could add trillions of dollars to the global economy, according to Planetary Resources... California-based Deep Space Industries and Washington State-based Planetary Resources are currently working toward extracting resources from asteroids in order to supply essentials out in deep space. [...] Both firms say they plan to launch spacecraft to prospect asteroids by late 2020, with mining taking place soon thereafter.” War in Space: The Science and Technology Behind Our Next Theater of Conflict

¹⁹ “While the current scale of the human presence in orbit is tiny—consisting of the six persons on the International Space Station (ISS) at any given time—this number may reach 1,000 people a year once orbital hotels and suborbital tourist services begin operation by 2020, if things go according to plan. Improving safety in space will then become a priority.” James Clay Moltz, Twenty-First-Century Space Security: Conflict or Collaboration?

²⁰ It is “estimated that some 160 constellations comprising 25,000 satellites are being proposed to go into orbit by 2025.” To put this in context, “there are currently around 1,400 active satellites in orbit.” Elizabeth Quintana, The New Space Age

²¹ Elizabeth Quintana, The New Space Age

²² The Kessler Syndrome says that any collision in space leads to increased likelihood of future collisions due to a cascading effect where each collision creates more debris. This “domino scenario becomes increasingly likely as the number of space objects increases” (Gabriel and Koven, Malicious Non-state Actors and Contested Space Operations).

²³ War in Space: The Science and Technology Behind Our Next Theater of Conflict

²⁴ The provision of (cube-) satellites is an opportunity. For example, “the demand for satellite capacity is expected to double in the next five years in sub-Saharan Africa.” China is leading the way here, supplying Ethiopia with a satellite for launch in 2019. The Netherlands is home to one of the largest CubeSat companies in the world, ISISpace, and one of the most promising start-ups, Hiber, among others. Greater government-commercial collaboration (as seen in the U.S.) could enable the Netherlands to enter the growing global CubeSat market.

²⁵ ESA. NANOSATELLITE TO SERVE THE INTERNET OF THINGS TESTED FOR SPACE. [https://www.esa.int/Our_Activities/Space_Engineering_Technology/Nanosatellite_to_serve_the_Internet_of_Things_tested_for_space/\(print\)](https://www.esa.int/Our_Activities/Space_Engineering_Technology/Nanosatellite_to_serve_the_Internet_of_Things_tested_for_space/(print))

²⁶ Peter van der Hulst. 'Zuid-Holland Space Valley van Europa'. https://www.leidschdagblad.nl/cnt/dmf20180926_82655943/zuid-holland-space-valley-van-europa?utm_source

²⁷ Moyer et al., “Power and Influence in a Globalized World | HCSS.” <https://hcss.nl/report/power-and-influence-globalized-world>

²⁸ “Like your mobiles, satellites are also getting smaller and better. Nanosatellites are those satellites that are just about the size of your shoe box. But, they can do almost everything a conventional satellite does, and that too at a fraction of the cost. Which is why everybody — from government organizations and start-ups to educational institutes — is scrambling to get a piece of the small-sat pie.” Singh, What are nanosatellites and why do they matter?, <https://www.geospatialworld.net/blogs/nanosatellites-or-small-satellites-are-going-to-play-a-big-role/>

²⁹ EU Commission. “EU Budget: A €16 Billion Space Programme to Boost EU Space Leadership beyond 2020.” Text. Internal Market, Industry, Entrepreneurship and SMEs - European Commission, June 6, 2018. https://ec.europa.eu/growth/content/eu-budget-%E2%82%AC16-billion-space-programme-boost-eu-space-leadership-beyond-2020_en.

³⁰ Airbus Defence and Space NL in Leiden; produce a.o. solar panels, develop folding mechanisms for satellites, Tropomi, and Ariane 5 and Vega rocket parts (Europe’s launch vehicles). ISISpace and Hiber are conducting groundbreaking work in (cube and nano) satellite proliferation.

³¹ Ariane 5 and Vega. <https://www.spaceoffice.nl/nl/activiteiten/esa/launchers/>

³² Space Economy. <http://www.spacesafetymagazine.com/space-on-earth/space-economy/>

³³ Dutch government publishing open satellite data to improve agricultural production (Dutch National Satellite Data Portal) | Joinup

³⁴ <http://www.tropomi.eu/>

³⁵ Its tasks are “[n]avigation, communication and earth observation... ‘Without this information it has become virtually impossible to carry out military operations.’” <https://www.tudelft.nl/en/2017/1r/royal-netherlands-airforce-to-go-into-space-with-a-little-help-from-tu-delft/> The Brik-II is again in collaboration with ISISpace, who along with Hiber are making a constellation of satellites.#