



**Reuters Institute Fellowship Paper**

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## **Satellite Journalism – The Big Picture**

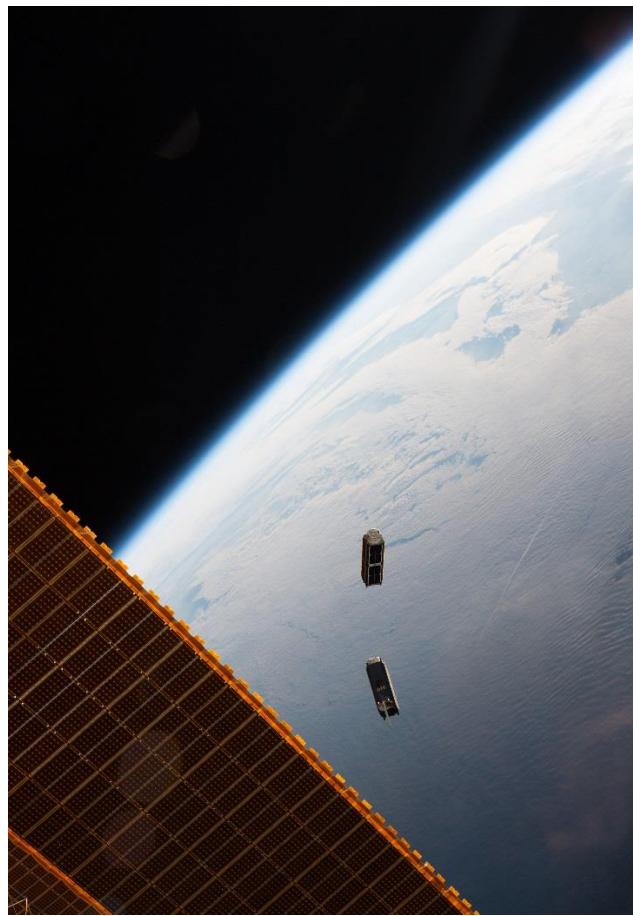
Newsgathering applications of emerging satellite technology

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Two shoe-box sized 'Dove' nanosatellites built by Planet Labs, are launched from the International Space Station May 17, 2016 Image: Courtesy NASA Johnson

## Abstract

*"The speed of communications is wondrous to behold. It is also true that speed can multiply the distribution of information we know to be untrue.*

*The most sophisticated satellite has no conscience"*

Edward Murrow, 1964

In his last public speech in 1964, the great American pioneer of 20<sup>th</sup> century broadcast journalism Ed Murrow noted that a satellite has no conscience: "*The newest computer can merely compound, at speed, the oldest problem in the relations between human beings, and in the end, the communicator will be confronted with the old problem of what to say and how to say it*".

Murrow was talking about the impact of early satellite communications on journalism - wonderous new technology that he worried could disrupt accurate reporting and accelerate the spread of disinformation. Observations that remain highly relevant today in this digital-driven age of alternative facts.

The satellites that captured Murrow's attention were relatively primitive platforms when compared to the constellations now being launched and adapted for news-gathering. What would he have made of this powerful new journalism tool now emerging? The satellite as an affordable, on-demand, global, 24/7 camera?

Today, we are in the midst of a space industry re-boot dubbed "The New Space Race" or "Space 2.0". It is essentially a satellite revolution, driven by a new generation of Silicon Valley-inspired tech disrupters who are challenging the long-established order of the space industry.

Nearly 500 satellites and other space objects were sent into Earth orbit in 2017, nearly doubling the number launched in 2016. Space entrepreneurs have announced plans to launch thousands more.

A key sector of this commercial satellite revolution is remote sensing, or Earth Observation (EO) – the business of watching us. And there are dozens of extraordinarily powerful EO applications including science, business, and journalism.

This report is not an academic paper, nor does it delve into the highly complex field of satellite technology. It is intended as a big-picture introduction to an extraordinary newsgathering and story-telling tool.

It examines media case studies, the two dominant US providers of commercial satellite imagery to media and raises questions on the applications and limitations of new satellite journalism. What is the potential of satellite newsgathering for journalists? How can journalists independently authenticate images provided by a third party? What are the censorship issues? What technical proficiency is required to interpret images? In an age when anyone with a credit card and internet access can already download archived satellite imagery, what are the security issues and responsibilities of journalists? And gazing into the not so distant future, what might satellite journalism look like 5 to 10 years from now?

### **Big Space vs The Disrupters**

Conventional satellites, the size of a bus, and costing up to half a billion US dollars, can take a decade to design, build and launch. By contrast, a new generation of disrupters offers an alternative to this enormously costly, complex capability - with cheaper, mass-produced units the size of a shoebox.

There is extraordinary diversity in technical and business innovation being applied. Why now? The small-sat revolution is being fuelled by miniaturised componentry from smart phones, combined with advanced analytics, cloud computing, machine learning - all enthusiastically bankrolled by venture and private capital.

In response, the “Big Space” corporations are rapidly adopting the can-do Silicon Valley mentality of the upstarts. Billionaire entrepreneur Elon Musk, whose SpaceX corporation pioneered the low cost commercial rocket business, has already launched the first test craft of a planned space-based internet network of 12,000-satellites. To put this into perspective, in 2017 there were just 1738 active satellites in orbit for the entire world.

The leviathan of the commercial Earth Observation industry is Colorado-based DigitalGlobe, with a fleet of five large, complex satellites, offering unprecedented 30cm resolution close-ups.

At the other end of the scale are the disrupters, with their constellations of small, cheap, mass-produced satellites that lack the capability of Big Space to zoom into a target. They specialise in the big picture; observing crop changes, deforestation, natural disasters or large man-made events such as the construction of refugee camps or the destruction of cities due to war.

Leading the disrupter pack in 2018 was California-based Planet Labs, operator of the world’s largest constellation of about 200 EO satellites, most of them shoebox-sized “Doves”. In November 2017 Planet announced that the Doves’ “Mission 1” was complete: the ability to image the entire land mass of Earth – every day – at a resolution of 3-5 metres.

Mission 1 effectively started the clock on what Planet calls its visual “time machine”. A rapidly growing database, pulling down more than 7 terabytes of data, 1.4 million images daily, giving customers a glimpse into the recently archived past - a snapshot of what happened, on any nominated day, at any land point on Earth.

### **So, what's in it for the media?**

Journalists have been quick to exploit these new opportunities to cover events where it may be too difficult, dangerous or costly to put reporting teams on the ground. Media access to satellite company images data bases has resulted, in some cases, in journalists gaining a near real-time reporting source for breaking stories.

One case study in this report examines how satellite imagery provided smoking-gun evidence for the Associated Press Pulitzer Prize-winning investigative reporting of human rights abuses in the Asian fishing industry.

Digital, TV and print all carry growing numbers of satellite imagery-led exposes of environmental destruction in remote locations such as the Amazon, before and after imagery of natural disasters, analyses of military build-ups such as China’s construction of artificial islands in the South China Sea, missile launches and nuclear testing in North Korea.

Satellite imagery has also become a compelling centrepiece for visual storytelling, the key element anchoring multi-media reports. UK-based citizen investigative journalism group Bellingcat has led the way in the emerging specialisation of data journalism that relies on

satellite imagery as an important tool in verifying information and social media imagery collated on the ground.

Foreign correspondents and the production teams of the TV networks already have decades of experience with satellite technology, but this capability has been about communication and transmission; sending stories from the field and reporters doing live crosses back to studio anchors, and broadcasting via satellite, to audiences in remote locations. The rapid evolution of technology has resulted in the capabilities of field satellite trucks being shrunk into laptop size units. Now, the option of using satellites to capture imagery from space, and not just re-transmit stories recorded on the ground, opens up new possibilities.

For less time-critical stories, there is also a growing torrent of lower resolution imagery (at 10-30 metres) coming from more established sources such as NASA, the European Space Agency and the US Geological Survey. Google, a variety of satellite-focussed non-profit groups and journalism educators are now helping reporters make sense of it all, running workshops on the skills required to interpret, analyse and visually decode what can be a deceptively complex specialty.

### **User Pays?**

Earlier attempts to create a viable commercial media market for satellite imagery failed, largely due to the unwillingness of news organisations to pay for the product. With the media industry in a state of long term disruption, amid constant restructures, budget cuts and staff reductions, paying for satellite imagery has not been perceived as a priority.

A major factor in the significant increase in media use of satellite imagery over the past two to three years can be attributed to two major US satellite companies, Planet and DigitalGlobe, providing their product free to select media organisations and individual journalists.

Satellite companies proclaim these arrangements are part of a broader social contract, promoting “radical transparency” and “democratisation of technology”. They also acknowledge such deals are marketing gold – prominent free advertising to support their strategies to attract more user-pays clients in other industries.

Another factor in the uptake of satellite imagery by journalists has been the rapid development in the resolution or sharpness of the imagery, enabling a greater range of stories to be told. Improved speed and reliability of service to media has also contributed. Satellite companies now provide some media clients with a near real-time news source via direct access to imagery databases. Additional specific requests for imagery are frequently met within 24-48 hours.

However, copyright issues can restrict access to free imagery, particularly for news agencies that syndicate stories, imagery and graphics. Provision of free imagery is largely conditional on the level of attribution or credit provided by the publication or broadcast. As detailed in the Botswana case study in this report, freelance journalists and those working for small circulation organisations, or under NGO auspices, have been charged commercial rates.

News organisations are unlikely to develop in-house satellite journalism capabilities soon, given that satellite companies mostly provide imagery for free. Other major disincentives are the high cost and complexity of stand-alone satellite imaging operations and the requirement for multiple ground stations to capture and process the data.

### **Yes, it is rocket science – sort of**

Utilising satellite imagery for journalism can be a deceptively complex task. Several journalists interviewed for this report emphasised how easy it was for the novice to get it wrong by misinterpreting the pictures, thus undermining the credibility of a story.

A growing number of non-profit satellite industry organisations, Google, scientists, journalism educators and the citizen-journalism group Bellingcat, are now running media workshops on understanding the technology and skills required. These seminars range from introductory sessions through to more complex training that frames satellite journalism as a subset of the burgeoning open-source “data journalism” field.

Imagery analysis is already a highly specialised, labour-intensive role. Managing and processing ever increasing amounts of data from Earth imaging satellites is making the job progressively more difficult. Satellite companies are now researching ways to increasingly automate the imagery analysis process.

### **Satellites, Spies and Journalism**

American satellite companies, heavily promote the civil, environmental, and commercial capabilities of their constellations, but the most lucrative paying customer is still the US Government – mainly the intelligence agencies.

This is not surprising. As with the satellite-based Global Position System (GPS) that now runs so much of our daily lives from phones, cars and myriad other civil applications, commercial Earth observation satellites evolved from technology originally intended for military and intelligence purposes. In the US, these satellite industry-intelligence community bonds remain strong.

America's intelligence agencies like what they see in this commercial satellite revolution and are investing heavily in it as a way of supplementing the much more powerful, but relatively few spy satellites.

Boundaries are blurring as satellite companies simultaneously service the growing (and in the past conflicting) demands of highly lucrative paying clients - intelligence organisations - and the growing source of free marketing, the media.

US intelligence officials have announced their intentions to build closer working relationships with non-government groups that utilise satellite imagery to investigate human rights abuses. In turn, these NGO investigators provide many journalists with stories of human rights violations.

### **US Censorship and ‘Shutter Control’**

While the growth of small satellite technology in other countries threatens its dominance of the field, the US was still the main player in 2018, so its policies have a global impact.

The US Government, through legislation and a licensing process, maintains control over the resolution of the imagery that American companies can disseminate and who can receive that product.

In addition, the US Government has long had a regulatory lever at its disposal called ‘Shutter Control’ that can ban American companies from distributing imagery deemed counter to US national security interests.

Shutter control has never been formally imposed as there have been more subtle methods of censorship. US officials purchased all available imagery of preparations to invade Afghanistan in late 2001 to deny media access to those pictures.

A former satellite company executive interviewed for this report says commercial pressure has also been applied as recently as 2007, when he claims Bush Administration officials called the key US imagery satellite providers – whose businesses depended on continued US intelligence contracts - to ensure pictures of an Israeli air raid on a suspected Syrian nuclear facility were not immediately released to journalists.

In 2018, the commercial satellite genie is well and truly out of the bottle, yet surprisingly, Washington still attempts to impose censorship by banning US satellite companies from releasing high resolution satellite images of Israel and the Palestinian Territories – citing Israeli security concerns. This restriction, known under US law as the Kyl-Bingaman Amendment, is now largely redundant due to the growing number of imagery satellites operated by companies in other countries. If journalists want hi-res satellite shots of the West Bank, they can now shop elsewhere.

### **Satellite Law and Lore**

As is the case with so many other tech-disrupted industries, the speed of this satellite revolution has left regulators, lawyers and privacy experts far behind. Yet, to date, this has not triggered any meaningful international debate on privacy or control.

This lack of public discussion is perhaps more surprising given a popular misconception, inspired by Hollywood and “Homeland”-style TV dramas, that satellites can easily read newspaper headlines or number plates from space.

Current commercial imaging technology does not have the capability to record identifiable shots of individuals, which may alleviate some, but not all, privacy concerns.

The exact resolution of America’s state-of-the-art intelligence-gathering satellites remains classified, although an expert cited by the Washington Post recently estimated a resolution of 7 cm per pixel in an image.

The highest resolution commercial imagery currently available (25-30cm under current US licensing controls) is clear enough to identify a vehicle but not a person.

Existing satellite technology also has some restrictions. Most Earth observation satellites mount electro-optical imaging systems, effectively cameras, that provide high resolution pictures but cannot shoot through cloud and smoke and have poor low light capability. The exception is the relatively few satellites equipped with infra-red or radar-imaging systems that gather imagery data that is more complex to process and interpret.

Live video from space is viewed by some analysts and imagery experts as the next significant milestone, a capability that may be achieved within 5-10 years, with journalists becoming major beneficiaries. However, the viability of live-from-space news satellites remains unresolved, with some specialists concluding that the technological complexity, combined with low Earth orbit patterns and optical physics, make the proposal commercially unworkable.

And if the live-eye-in-the-sky does become a reality, will it ultimately make any difference in a world of Google street view, surveillance cameras and hobby drones hovering over backyards – all of which can easily record more detailed up-close-and-personal imagery?

There are no complaints from commercial satellite imagery companies or media organisations. Most appear content with the working relationships now evolving and the myriad positive applications for journalism.