

# Group Final Paper Sample

Team Name:

Team Members:

Topic: Should the federal government continue to launch and support weather satellites or should this be privatized?

**Position: (CON) The federal government should not continue to launch and support weather satellites.**

Roles:

In addition to supplying content to the assigned sections, each member is responsible for providing at least two sources and providing an MLA Annotated Reference and two questions to pose to the opposing team during debate.

Each member has been assigned the following sections.

- Member 1 - Introduction
- Member 2 - Sub Topic A: Cost and Efficiency
- Member 3 - Sub Topic B: Current Focus, Performance and Reliability of Government Vs Private Weather Service
- Member 4 - Sub Topic C: Economic and Social Benefits of Private System
- Member 5 - Conclusion

## Introduction (Member 1)

Whether to privatize weather satellites or continue to let the federal government launch and support them has been an overarching debate for years. Despite legislation over the years, our group calls for a bigger change in the way we manage weather satellites. We establish our position as against the continuation of the federal government launching and supporting satellites, and thus in favor of privatization.

It is first important to look at the significance of satellite data and the reality of data gaps with the existing satellite programs. According to Crain and Miglarese, "Satellite data account for more than 90 percent of the data that go into weather forecast models... a gap in this data 'would erode everyday weather forecasts and expose the nation to a 25% chance of missing extreme event forecasts...'" ("A Better Way To Weather the Satellite Gap"). According to the US Government Accountability Office, these data gaps could span up to a year or even more (Mitigating Gaps in Weather Satellite Data). This is a very pressing issue because weather satellite data is at risk, and that can negatively impact the safety of everyone who relies on weather forecasts.

This likely possibility of widespread data loss will have a detrimental impact on the weather system. The main issues that satellite data gaps will cause are less accurate and less

timely forecasts and warnings of extreme weather events (“Mitigating Gaps in Weather Satellite Data”). Such events include storm surges, hurricanes, floods, and more. The lack of punctuality of these important weather warnings will endanger people, property, and infrastructure.

The current satellite programs, run by the NOAA and the DOD, have “troubled legacies of cost increases, missed milestones, technical problems, and management challenges that have reduced functionality and delayed launch dates (“Mitigating Gaps in Weather Satellite Data”). On the other hand, we believe private satellite firms will be able to improve and expand the weather system. According to Andrew Freedman, privatization could boost forecast accuracy and revolutionize climate adaptation, urban planning, farming, and even insurance claims processing (“The Space Race is on for Climate, Weather Privatization.”)

Throughout this debate, you will hear detailed arguments that highlight evidence as to why we believe privatization of weather satellites is essential. We will discuss how the private sector can produce and maintain satellite weather data more efficiently, effectively, and accurately, in order to ensure that our nation is safe and informed about weather. You will hear about cost and efficiency, reliability of government vs private weather services, and economic and social benefits of the private weather system.

### Questions for opposing team:

1. Q:How is the NOAA addressing the issue of satellite data gaps?
2. Q: Are said technical challenges and management problems slowing down the improvement of current weather satellite systems?

## Sub Topic A: Cost and Efficiency (Member 2)

Pro: The government can produce and maintain satellites weather data more efficiently than the private sector.

**Con: The private sector can produce and maintain satellites weather data more efficiently than the government.**

One of the major faults in the government weather satellite programs is that they do not reach the full potential they are intended to achieve. We believe that private satellites have the ability to obtain sufficient funding through capital markets that will allow for further research and development. We also believe that this new market will create competition which will lead to advancements in technology, economic opportunities and better prices for purchasing weather data.

The government weather satellite programs have a poor history with receiving sufficient funding for publicly funded weather satellites. There have been a number of cases throughout weather satellite development since the 90's that have experienced schedule delays, cost overruns, missed deadlines and more. One major example was the National Polar-orbiting Operational Environmental Satellite System (NPOESS). According to an article written by Gemma Cirac-Claveras, costs "ballooned from \$6.5 billion to \$15.1 billion, and no satellites [were] placed in orbit" (Cirac-Claveras, Gemma). The NPOESS satellite partnership was cancelled in 2010 after being five years behind schedule and almost 25% over budget. This example shows how the US government has had a history of funding weather satellite programs that have failed to meet the standards set. It gives reasoning to collaborate or depend on private sectors to end this reputation set by the government.

Not only will private satellites improve the research and development of weather data, it will further open a market with the potential to create huge revenues. According to a 2006 survey conducted by the American Meteorological Society, the "private meteorology industry earns revenues in excess of 1.8 billion dollars (Beyond the NWS)". By giving more freedom to allow the private sector to operate weather satellites, the market will grow. This can increase capital used to fund the advancements of weather satellites as well as improve the entire US economy.

Data gathered from commercialized weather satellites can also help the government by removing costs. Congressman Jim Bridenstine "argued that commercial data constituted a more efficient use of public resources because the purchase of data from commercial satellite vendors could lead to best pricing and generate revenues through tax-paying jobs and data sales" (Cirac-Claveras, Gemma). His reasoning behind his argument is that if that private sector of weather satellites expands, tax paying jobs will be created and competition between data vendors will lead to the best pricing. It would lead to the option for the government to buy data and services of private companies instead of buying, owning and operating government systems.

## Questions for opposing team:

1. Q: What changes have been made to the government and the NOAA that ensures it will end its reputation with weather programs doing poorly?
2. Q: Would it be easier for the government to let private companies own and operate weather satellites and simply buy the data from them?

## Sub Topic B: Current Focus, Performance and Reliability of Government Vs Private Weather Service (Member 3)

Pro: Demonstrate how Government program is excelling. Demonstrate shortcomings of private technology.

Con: Demonstrate where private solutions are excelling and where Government weather data is lacking or the program is inefficient.

Sadly, there is a severe lack of weather specific private sector satellite providers. But it stands to reason that the weather community at large would benefit from the cost savings and innovations that the private sector of satellite imagery and observations can provide.

Other branches of the US government have embraced and benefited by partnerships with private providers. Documents from the National Security Archive show that the NSA has supported commercial companies to improve, augment and innovate surveillance and reconnaissance since first commercial satellite launch of LANDSAT in 1972 (“Declassified Documents Trace U.S. Policy Shifts on Use of Commercial Satellite Imagery from 1970s to Today.” National Security Archive). By evaluating satellite images of corn fields, Descartes Labs correctly predicted a shortage in domestic corn production. (Shaw, Carrie. “Satellite Companies Moving Markets”) The private sector has outperformed USDA crop yield forecasting, and has since been adopted as a viable resource in reporting of forecasting crop health and production levels.

Through government legislation NOAA and NASA have been forced to investigate how commercial solutions could be used to augment or replace their efforts. NASA and NOAA’s reluctance to comply has jeopardized the effectiveness of data collection and analysis. As Margueritte pointed out in our introduction argument, we are at a serious risk of gaps in our data collection if the approach does not change. We need to abandon the traditional system of monolithic ‘large and expensive government “catch-all” systems’. GNSS-RO data can be obtained using low cost craft and minimum instrumentation. According to Anne Hal Miglarese, CEO of Planet IQ, private companies could develop and launch a larger array of sensors that could be deployed separately at a lower cost and offer a larger sampling size. (Miglarese, Anne Hal. “The Benefits of Public-private Partnership in Weather and Environmental Data Collection”).

It was only in 2016 that the Space Commercial Policy mandated NOAA take actionable steps to support commercial data. The CWDP named GeoOptics and Spire as the initial private companies considered for the program. As of 2016 Spire has launched more than 20 satellites

and successfully provided data to NOAA (“Commercial Weather Data Pilot (CWDP).” *Office of Space Commercialization, National Oceanic and Atmospheric Administration*). These companies don’t have any nefarious agendas or plans of exploitation. Spire view reflects that of many of the private entities. Spire “advocates for an open market for data within the weather industry, where NOAA is just a client amongst many others.” (Cirac-Claveras, Gemma. “Weather Satellites: Public, Private and Data Sharing. the Case of Radio Occultation Data.”)

Currently NOAA is spending \$20 million a year on commercially provided data and imagery. GeoEye supplies NOAA imagery to study the color of oceans. AMDAR and Vaisala provide NOAA wind, temperature and lightning data. It is clear that NOAA has the framework in place to partner with commercial entities, yet they still resist opening the doors for weather focused satellite operators (Cirac-Claveras, Gemma. “Weather Satellites: Public, Private and Data Sharing. the Case of Radio Occultation Data.”). We believe the free market approach to satellite data would improve the quality and scope of weather forecasting.

### Questions for opposing team:

1. If the National Weather Service’s core focus is to provide accurate forecasting, what are the risks of the measured data being purchased from a private source?
2. Monolithic satellite technology is both expensive and time intensive. Are there any trends from the private sector that NOAA or NSA should embrace?

## Sub Topic C: Economic and Social Benefits of Private System (Member 4)

Pro: Costs of the private system on the public.

Con: The private sector will better serve the public interests. Identify social and economic benefits.

A large misconception that people fear when it comes to privatizing the development of weather satellites is that they will have to pay for weather reports or pay for satellite development. The reality is that the working class in our country already are paying for the funding of these satellites with their taxes. NOAA received \$1.58 billion from the government for their satellite procurement activities this year (Foust, Jeff. “NOAA Budget Request Prioritizes Current Satellite Programs over Future Ones.”). Ultimately, the financial risks that are associated with satellite development and launch will be transferred from the government to the private sector benefitting taxpayers. (Migliarese, Anne Hale. “The Benefits of Public-private Partnership in Weather and Environmental Data Collection”)

Even though it may seem as if NOAA has received an enormous amount of money from the government, their budget funding for this year was \$400 million less than the previous fiscal year (Foust, Jeff. "NOAA Budget Request Prioritizes Current Satellite Programs over Future Ones."). This ties into the production delays and outdated data methods that have resulted in less accurate forecasts, delayed warnings, an expensive supply of inconsistent data, and overall higher costs. (Migliarese, Anne Hale. "Sense of Urgency Needed to Steady U.S. Weather Forecasting.")

Using a private system will provide the funding necessary to bridge these delays and result in faster innovation in sensor and satellite development, which will improve weather forecast timelines and economic stability. Agriculture would benefit greatly from this because 90% of their crop losses are due to weather events, and 25% of these weather-related losses could be prevented using better weather predictive modeling. Transportation also would benefit, and IBM is a great example of the success resulting from using Panasonic's weather forecasting, which is privately funded. IBM's loses \$8.7 billion a year due to weather related delays, and through Panasonic's weather forecasting they have improved their commercial craft climb profile, reducing fuel consumption by 10% during ascent. (Walker, Jon. "AI for Weather Forecasting - In Retail, Agriculture, Disaster Prediction.")

Improving accuracy for forecasting is also crucial for disaster relief. It can save lives and speed up rebuilding efforts. IBM is already delivering damage predictions that are 70-80% accurate 72 hours before a storm is predicted. The accuracy of these predictions has helped cut back the \$20 billion to \$70 billion cost of weather related power outages. IBM owns the company Weather Underground, and most of their data production is from privately owned weather stations. Their weather service continues to be free and they have proven to be successful in cutting back transportation and disaster relief costs using data and predictive modeling from privately funded sources. (Walker, Jon. "AI for Weather Forecasting - In Retail, Agriculture, Disaster Prediction.")

## Questions for opposing team:

1. Q: Weather Underground collects data from private weather stations and continues to be free, knowing this how can you be certain that subscription fees would be mandatory if weather is privatized?

## Conclusion (Member 5)

The evolution and improvement of weather satellites over the years has played a massive role in the success of weather forecasting. A major part of this can be traced back to privatization, and we believe that the federal government should not continue to launch and support weather satellites. The U.S. federal government has had a lot of successful contributions to the field of weather satellites, but private and commercial companies over the years not only challenge the works of the government, but simply outperform them in many aspects. According to Jim Bridenstine, chairman of the Environment Subcommittee of the House Science Committee, commercial weather satellites have the capacity to generate more and better data for the nation's weather enterprise. (Henry, Mike. "NOAA and DOD Piloting Commercial Sources of Weather Data"). Bridenstine further adds that adding commercial weather data sources will not only reduce the cost to the federal government but will also fuel innovation and increase the resiliency of the U.S. weather satellite systems.

It has been proven that commercialized programs can and have been adequately funded through capital markets, while missions under NOAA struggle to receive funding from the government. Private providers such as Panasonic, GeoOptics, and PlanetIQ all offer cost effective alternatives to the government run weather models. According to Neil Jacobs, of Panasonic Avionics Corp., "NOAA used to be the No.1 forecasting [producer] on the planet, but now I think you are seeing private companies, including Panasonic, developing forecast models that are better than what NOAA has". Additionally, NOAA and the government has been urged to work with commercial companies and use data collected privately by these companies to expand and improve their services, thus creating partnerships between the private and public sectors, which would only benefit the weather system as a whole. (Ogburn, Stephanie. "Industry and House urge NOAA to use commercial weather data"). Tom Yunck, founder of GeoOptics, mentions that he would launch GeoOptics' satellite CICERO with private funds and later licence the data to the United States. (Hand, Eric. "Microsatellites aim to fill weather-data gap"). The fees the government would have to pay to these private companies are miniscule compared to the billions of dollars spent on the massive government satellites.

Throughout this debate we have consistently shown the advantages of privatization and the shortcomings of the federal government launching and supporting weather satellites; and we believe that privatization will bring more effective, precise, and advanced data to the field of weather forecasting.

## Questions for opposing team:

1. Q: Taking NOAA's previous missions that have struggled to receive adequate funding into account, how does NOAA aim to not repeat those failures and put out the best researched data possible ?

2. Q: Private companies stimulate the weather economy and raise competition, can the public sector promise to do the same to increase innovation among the U.S industry?

## MLA Annotated Bibliography

Cirac-Claveras, Gemma. "Weather Satellites: Public, Private and Data Sharing. the Case of Radio Occultation Data." *Space Policy*, 2018,

<https://www.sciencedirect.com/science/article/pii/S0265964618300390>

Accessed 20 September 2018.

This article examines the impact of the 2017 Weather Research and Forecasting Innovation Act that requires NOAA to investigate the viability of commercial satellites as supplement or replacement to NOAA technology. By observing the commercial data collected by the Global Navigation Satellite System, the article identifies and investigates the many players involved in this process. It explores the arguments and conflicts between Government, Scientific Community, Forecasters, NOAA and the private sector by tracing how the data is obtained and shared. The article traces the history of governmental acts, the current involvement of private companies and the arguments for and against privatization.

[Member Name]

"Commercial Weather Data Pilot (CWDP)." *Office of Space Commercialization, National Oceanic and Atmospheric Administration*, 2018,

<https://www.space.commerce.gov/business-with-noaa/commercial-weather-data-pilot-cwdp/>

Accessed 19 September 2018.

This page describes the NOAA Commercial Space Policy, which requires NOAA to explore how commercial weather products can be integrated into NOAA models and observations. The page describes the NOAA's Commercial Weather Data Pilot (CWDP) and lists information on the requirements and findings of the pilot's three rounds.

Information is given on the contract awards, budgets, plans and legislation.

[Member Name]

"Declassified Documents Trace U.S. Policy Shifts on Use of Commercial Satellite Imagery from 1970s to Today." *National Security Archive*, 27 November 2012,

<http://trumanfactor.com/2012/us-policy-shifts-on-use-of-commercial-satellite-imagery-11404.html>

Accessed 24 September 2018

This article examines the history of the relationship of the United States National Security interests and private commercial satellite entities. It traces the relationship using 39 documents obtained by the Freedom of Information Act requests. It traces the history of satellite imagery from its highly-classified beginning to a technology available simply via a simple web browser.



[Member Name]

“First Private Weather Satellites.” *Science*, vol. 353, no. 6306, Sept. 2016, p. 1345. EBSCOhost, <http://web.b.ebscohost.com.proxy-um.researchport.umd.edu/ehost/pdfviewer/pdfviewer?vid=5&sid=1ee04c5a-bf87-4219-abe4-a0531a68eff9%40sessionmgr101>.

Accessed 24 September 2018.

This article describes the NOAA’s first action to support commercialized weather satellites. It explains the NOAA’s awarding of pilot contracts and small deals to GeoOPTics and Spire Global. It also states that the reason for reaching out to private weather satellites is due to cost overruns by the government funded programs.

[Member Name]

Foust, Jeff. “NOAA Budget Request Prioritizes Current Satellite Programs over Future Ones.” *Space News*, 26 May 2017,

[spacenews.com/noaa-budget-request-prioritizes-current-satellite-programs-over-future-ones/](http://spacenews.com/noaa-budget-request-prioritizes-current-satellite-programs-over-future-ones/).

Accessed 5 October 2018.

This article discusses the 2018 fiscal year budget request for NOAA. It goes into detail about the previous years budget and the current years budget. The current year’s budget is less than the previous year, which results in many issues for future development of new weather satellites. It discusses the cost of GOES-R satellite programs and how this budget cut affects the program.

[Member Name]

Freedman, Andrew. “The Space Race is on for Climate, Weather Privatization.” *Climate Central*, 13 July 2015,

<http://www.climatecentral.org/news/the-space-race-is-on-for-climate-weather-privatization-16243>

Accessed 22 September 2018

In this article, Freedman explores the opportunities that private weather satellite firms could bring. He also evaluates the relationship between the federal government and these private firms, including how that relationship will change in the future if weather satellites are privatized. Further, this article outlines the billions of taxpayer dollars that the government uses on satellites built by private companies, such as Lockheed Martin and Ball Aerospace. In relation, Freedman also touches on the satellite data gap due to the many difficulties the government has had with this for years. As a result, the government is behind schedule and over budget on many of their weather and climate satellite programs.

Hand, Eric. “Microsatellites Aim to Fill Weather-Data Gap.” *Nature*, vol. 491, no. 7426, 28 Nov. 2012, pp. 650–651., doi:10.1038/491650a.

<https://www.nature.com/news/microsatellites-aim-to-fill-weather-data-gap-1.11903>

Accessed 23 September 2018.

This article identifies the problems of the government ran satellite COSMIC, and its potential commercial successor CICERO, launched by GeoOptics. Radio sounding techniques, such as radio occultation are explained in this article, as COSMIC uses the delay of GPS radio signals to measure atmospheric density; which in turn can provide information on temperature and moisture levels. Tom Yunck, founder of GeoOptics is also mentioned here, and he speaks on his hopes of transforming the weather economics by collaborating with agencies in the U.S. but building his projects with private funds, essentially creating a public-private partnership. The significance of this article is to shed light on CICERO and how microsattelites could set the stage for commercial systems.

[Member Name]

Henry, Mike. "NOAA and DOD Piloting Commercial Sources of Weather Data." *Robert Bacher | American Institute of Physics*, 21 Apr. 2017,

<https://www.aip.org/fyi/2016/noaa-and-dod-piloting-commercial-sources-weather-data>

Accessed 22 September 2018.

This article mentions the National Oceanic and Atmospheric Administration (NOAA) and the Department of Defense (DOD) initiating projects to explore the possibility of using commercial space-based sources of data for weather forecasting. This article mentions several private companies (PlanetIQ, Spire, Tempus) trying to enter the market for space based data, which in turn has interested Congress, NOAA and DOD to consider collaborating with the private sector. It sheds light on the hearings and the bills on the possible collaboration of the public and private sectors, and also shows us that there are vocal supporters and wary non believers to this cause.

[Member Name]

Mandel, Richard, and Erik Noyes. "Beyond the NWS: Inside the Thriving Private Weather Forecasting Industry." *Weatherwise*, vol. 66, no. 1, Jan. 2013, pp. 12–19. EBSCOhost,

<http://web.b.ebscohost.com.proxy-um.researchport.umd.edu/ehost/pdfviewer/pdfviewer?vid=1&sid=f44ce2b8-f48d-42de-b171-dc7e338f60ce%40sessionmgr103>

Accessed 21 September 2018.

This article discusses the role of private weather companies. It explains what roles it serves for society in both local weather forecasting and large scale weather forecasting. It touches on how the private weather industry coexists with the government weather programs. The article also lightly describes how the business side of the private weather industry plays a role on pricing for data.

[Member Name]

Migliarese, Anne Hale. "Sense of Urgency Needed to Steady U.S. Weather Forecasting."

*Washington Post*, 28 March 2014,

<https://www.washingtonpost.com/news/capital-weather-gang/wp/2014/03/28/sense-of-urgency-needed-to-steady-u-s-weather-forecasting/>

Accessed 23 September 2018.

This article discusses the outperformance of the U.S. global weather model in comparison to other nations. U.S. model inaccuracy has led to a human and financial impact, and the weather forecasting for the U.S. is on track to become worse instead of better. Government funded satellite programs have created a gap in weather modeling due to the lack of funding. U.S. companies that are privately funded have been developing and launching their own weather satellites to provide the quality of data needed to reduce the gap that has been created. They are also doing so for much cheaper than government operated satellite programs.

[Member Name]

Migliarese, Anne Hale. "The Benefits of Public-private Partnership in Weather and Environmental Data Collection" *PlanetIQ*, 2013,  
<http://planetiq.com/index.php/the-benefits-of-public-private-partnership-in-weather-and-environmental-data-collection>

Accessed 21 September 2018.

This article outlines the benefits to both government and consumers that could be achieved by a public-private partnership model for satellite data providers. It argues that in other fields, the government has supported and benefited from use of commercial satellite imagery products and the same could be done for weather data. By leveraging private capital and technology, the long term costs are dispersed and decreased while the project timeframe and launch effectiveness is improved. By abandoning the traditional system of aggregate 'large and expensive government "catch-all" systems', a larger array of sensors could be deployed separately at a lower cost and with a larger sampling size. It argues that the data supply from private providers would be less susceptible to data gaps, and by offloading the burden of data gathering from the government, funds could be focused on improving forecasting and models.

[Member Name]

Migliarese, Anne Hale and Crain, David J. "A Better Way To Weather the Satellite Gap" *Space News*, 16 December 2013,  
<https://spacenews.com/38720a-better-way-to-weather-the-satellite-gap/>

Accessed 21 September 2018.

This article describes the importance of satellite data in NOAA's current forecasting models and identifies the risk of data gaps due to satellite end of life and current mission delays. NASA and NOAA are unable to produce smaller and less expensive "gap-filler" satellites in a timely manner. Commercial satellite operators claim they are capable of a 6 month launch time. It argues that the commercial satellite economy would strengthen observation data, lower costs and provide an industry for employment.

"Mitigating Gaps in Weather Satellite Data", *US Government Accountability Office*, 2017,  
[https://www.gao.gov/highrisk/mitigating\\_gaps\\_in\\_weather\\_satellite\\_data/why\\_did\\_study](https://www.gao.gov/highrisk/mitigating_gaps_in_weather_satellite_data/why_did_study)

Accessed 22 September 2018

This article describes the satellite systems that the US currently relies on for weather observations and forecasts, as well as who is responsible for these systems (NOAA and DOD). It acknowledges the difficulties the programs are having, such as cost increases, missed milestones, technical problems, and management challenges. These problems are leading to risk of gaps in weather satellite data. The article also highlights the repercussions of satellite data gaps, such as less accurate and timely weather forecasts. The article mentions the possibility of endangering lives and property as a result of the possibility of inaccurate or delayed warnings during extreme weather events.

Ogburn, Stephanie Paige, and E&E. "BUSINESS: Industry and House Urge NOAA to Use Commercial Weather Data."

<https://www.eenews.net/stories/1059997252>

Accessed 23 September 2018.

This article discusses how the services of NOAA could be improved, by implementing research and data from private weather-observing companies and how the weather community has been pitching the idea of using private, purchased data. This article also mentions a new weather bill that passed, the "Weather Forecasting Improvement Act," which encourages NOAA to perform more cost-benefit assessments that would ensure that we are getting "the most bang for our buck" for data. The implication of this article is that both the private and the public sectors are encouraged by the bill to improve the integration between each other.

[Member Name]

Samenow, Jason. "NOAA Awards First-Ever Satellite Data Contracts to Private Industry." *The Washington Post*, 16 September 2016,

[www.washingtonpost.com/news/capital-weather-gang/wp/2016/09/16/noaa-awards-first-ever-satellite-data-contracts-to-private-industry/](http://www.washingtonpost.com/news/capital-weather-gang/wp/2016/09/16/noaa-awards-first-ever-satellite-data-contracts-to-private-industry/).

Accessed 23 September 2018.

This article identifies private companies that were awarded contracts by NOAA to join the government in obtaining weather data for the purpose of enhancing weather forecasts. The article explains that by awarding contracts to private providers such as GeoOptics and Spire Global, there is a further incentive for similar companies to launch satellites and use their data to improve the forecasting of weather. This article further delves into the aforementioned companies, referring to the impressive numbers and data put out by them, while also mentioning the lower cost and smaller size of the private satellites, unlike NOAA's. The significance of this article is that by rewarding these smaller, privately run companies, it creates a further incentive for them to launch satellites, which could very well revolutionize the world of weather forecasting.

[Member Name]

Shaw, Carrie. "Satellite Companies Moving Markets" *Quandl*, 06 July 2016,

<https://blog.quandl.com/alternative-data-satellite-companies>

Accessed 21 September 2018.

This article identifies several interesting ways people are deriving value from satellite data. There are two types of entities in the private satellite sector: Those who produce the technology and those who analyze the data. The article goes on to identify the companies occupying the spaces and offers a profile of the companies. The implication of the article shows that there is no shortage of private entities looking to enter the sector, and private equity is driving innovation and reducing cost.

PalanetIQ is focused on studying the atmosphere, weather, forecasting and climate modeling. They plan to launch 12 microsattellites, called Pyxis, in 2018. These satellites will use radio occultation, capable of penetrating clouds and storms.

Urthcast plans to launch 16 satellites by 202 that combines high definition video and radar to penetrate weather.

[Member Name]

Shepherd, Marshall. "When It Comes To U.S. Weather Forecasting: Private, Public Or Both?" *Forbes*, 07 June 2016,

<https://www.forbes.com/sites/marshallshepherd/2016/06/07/when-it-comes-to-u-s-weather-forecasting-private-public-or-both/#4e1901a03a37>

Accessed 19 September 2018.

This article explores the relationship between private companies and the National Weather Service. It explores the claims made by several private companies that their technology and cost can outperform NOAA. The article explains the complex relationship between NOAA services and how private companies augment this data. The article explores the risk of fully privatizing the service. A notable quote from National Weather Service Deputy Director Laura Furgione: "If you solely rely on the private sector for the public safety service, you can't assume the company will always stay in business and if they go under, you have lost your source of service."

Walker, Jon. "AI for Weather Forecasting - In Retail, Agriculture, Disaster Prediction."

*TechEmergence*, 08 October 2017, [www.techemergence.com/ai-for-weather-forecasting/](http://www.techemergence.com/ai-for-weather-forecasting/)

Accessed 21 September 2018.

This article discusses the impact that weather related forecasting has on businesses and governments. The smallest advancement in prediction technology would result in large strides agricultural benefits that are severely impacted by weather. Incorporating private funding to the development of satellites and other prediction technologies also would benefit transportation, disaster, and retail relief that are all impacted by weather forecasting.

[Member Name]