Reassessing the Wheel: Applying the Lessons from the Infrastructure of Robert Moses to Modern Municipal Decision-Making

A thesis submitted by

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In partial fulfillment of the requirements for the degree of

Master of Arts

in

Urban and Environmental Policy and Planning

Tufts University

May 2025

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Abstract

This thesis examines how cities draw on the history of introducing new technology when considering new transportation methods, such as eVTOLs. The thesis uses the infrastructure created by Robert Moses in 20th Century New York City as a historic example to showcase the faults in attempting to provide effective transportation for the citizens of New York while preserving the attributes that are essential to an urban community. This framework allows an exploration of the decision-making and critiques of that particular example and the applicability of those aspects to new transportation methods today such as eVTOLs.

Through a case study, analysis of current publications and interviews with policymakers and industry professionals, this study explores the urban implications of adapting new transportation technologies. It concludes with a critique of the tendency of decision-makers to prioritize technological deterministic ideology at the expense of holistic, problem-focused decision-making.

Acknowledgements

At some point in 2012 I started to get interested in urban planning. I was living in Oklahoma City, while serving in the Navy. I've always hated driving; it is just so flabbergasting to me that we designed a world where it's essential to own a vehicle and take enormous risks every day simply to run errands or get to work. I moved to Boston in 2015, a city where I was able to avoid owning a car, and started volunteering at LivableStreets, a local nonprofit focused on advocating for the types of changes I'd like to see in transportation. At the same time, I continued to pursue my professional passion around aviation at Aurora Flight Sciences. Slowly, these two interests merged as I began working on eVTOLs. The technology was incredible but I was hesitant about whether this is the right application to the right problem. In 2020, during COVID, I began to pursue a degree at Tufts and this thesis is the culmination of that effort.

I want to thank those who put me on that path, from Steve Clark and Jessica Edmonds for bringing me onboard to Aurora Flight Sciences and giving me a chance, to Diana Siegel, Larry Wirsing, and Brian Yutko for providing me with the opportunity to work on eVTOLs at Aurora. I want to thank Stacy Thompson at LivableStreets for molding and nurturing my views on urban planning. I want to thank the professors and students at Tufts, especially Rebecca Shakespeare, Christine Cousineau, and my advisor, Justin Hollander, for helping me navigate this degree and putting up with my constant nonsense.

I want to thank my mom, who as always installed a sense of drive in me and always supported my new interests. I want to thank my friends, especially Colin, and everyone in my Syracuse group chat, who I love arguing with (Mike, I'm right about congestion pricing), and reminding me to be passionate.

Most importantly, and above all, I want to thank my husband, Andrew, for dealing with me, over these past years. He's always willing to help (this thesis would be "unitelligable" without him) and provide me with the support I need to accomplish my endless projects. Andrew – this is the last project (for now). I love you.

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Chapter 1: Introduction

There is a scene in Marcel Proust's autobiographical novel, *Remembrance of Things Past,* about the time he rented an automobile for a day trip.[1] He and his girlfriend, Albertine, used the car to visit two sets of friends in two nearby towns, Sant-Jean-de-la-Haise and La Raspelière, in opposite directions from their home. This was an incredulous idea; visiting friends 30 kilometers away in one direction, and then doubling back to make another visit 25 kilometers on the other side of their hometown. In his description, he noted that rather than enjoying their time with the first set of friends, Albertine seemed more concerned about "making good time" and getting on the road to see the other friends. To Proust, it seemed that the joy of a relaxing visit had turned into a tightly packed schedule, expanding the number of locations but sacrificing the ability to truly enjoy any one place.[2]

With the Agricultural Revolution, we traded our nomadic skill set for safety in numbers, stability of established urban centers, longer lifespans, efficiency of resources, and all the highlights of modern life. With this new sedentary lifestyle however, we became victims of the tyranny of distance and strove to conquer it at faster speeds, hoping to quickly be back to the familiarity of our settled communities. Until the domestication of rideable animals such as horses around roughly 5,000 BCE[3], humans were limited to distances that they could travel with their own two feet; about 20 miles/day. With horses, that travel radius roughly doubled, and today with planes, trains, and automobiles, there is quite literally no

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[1] Marcel Proust, *In Search of Lost Time*, ed. William C. Carter, trans. Charles Kenneth Scott-Moncrieff, vol. 4 (New Haven: Yale University Press, 2021), 435.

[2] Peter Frank Peters, *Time, Innovation and Mobilities: Travel in Technological Cultures*, International Library of Sociology (New York: Routledge, 2006), 40.

[3] Christina Larson, "Archaeologists Find Evidence That Horseback Riding Began at Least 5,000 Years Ago," PBS News, March 3, 2023, https://www.pbs.org/newshour/science/archaeologists-find-evidence-that-horseback-riding-began-at-least-5000-years-ago.

distance that is too dangerous to travel. For most people, a 500-[4]mile drive or a 12-hour flight may be annoying, but it's not dangerous in the way our ancestors looked at long-distance travel. Today, when traveling, there is little chance of not having shelter, or being attacked by wild animals or bandits. When Proust and others started to use automobiles for travel, we conquered the impact of distance while still maintaining our aversion to time spent while traveling. Proust's girlfriend showed anxiety and potential remorse around time that was only made possible by more opportunities through longer, faster travel. Our fear of the unknown seemed to have been traded for a "Fear Of Missing Out". Faster travel times, along with other modern technologies like smartphones, have opened many possibilities, but these possibilities have turned into demands. As Proust said:

> We realized this as soon as the vehicle, starting off, covered in one bound twenty paces of an excellent horse. Distances are only the relation of space to time and vary with it. We express the difficulty that we have in getting to a place in a system of miles or kilometers which becomes false as soon as the difficulty decreases [5]

Automobiles, like any machine or tool, are wonderful at improving upon a stated goal and they make complete sense in a wide array of applications such as emergency vehicles, the trucking industry, or personal travel to remote areas. Urban residents like Proust soon began to find that automobiles contradicted or at least created friction with some fundamental aspects of what they had long been familiar with and built society around them; the joys of living a lifestyle dependent not on travel but being in close proximity to friends and society. This study examines how New York City (referred to in this thesis as "New York City" or "New York", unless otherwise made clear) managed the integration of automobiles and related infrastructure in the post-war era and extracts urban principles from this historical

[5] Proust, *In Search of Lost Time*, 4:435.

experience. **How do cities draw on the history of introducing new technology when considering new transportation methods, such as eVTOLs?**

Starting in the 19th Century, new modes of travel such as trains and streetcars began to make travel to and within a city faster, leading to this inevitable clash with basic elements of what define an urban environment, density and stability of the population. An American sense of technological determinism pushed by the automotive industry met the polluted, crowded cities caused by the Industrial Revolution, resulting in suburbs with their promise of expansive private property. One could work a job in an urban area while retiring each day to a nearby suburb where space and privacy were maximized. This physical expansion tied well with the sense of optimism that had grown around technology since the Industrial Revolution. Governments quickly poured on support for the automobile in many forms but most obviously in infrastructure, taking the form of bridges, tunnels, highways, and parking lots. Unfortunately, in hindsight we now know these came with the uncalculatable costs of hastily implemented plans around racism[6], pollution and health costs[7], public debt[8], urban neighborhoods and forms were bisected by physical barriers like interstates or in many cases, literally torn down because of "urban renewal" plans.

In the early 20th Century, nowhere was this more obvious than in New York City. Like today, New York was the largest and densest city in the United States[9] and was the site of some of the first

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[6] Noel King, "A Brief History Of How Racism Shaped Interstate Highways," *NPR*, April 7, 2021, sec. History, https://www.npr.org/2021/04/07/984784455/a-brief-history-of-how-racism-shaped-interstate-highways.

[7] Craig LeMoult, "Car Pollution In Boston Area Neighborhoods Poses Health Risk To Residents, New Research Finds," GBH, September 22, 2019, https://www.wgbh.org/news/local/2019-09-22/car-pollution-in-boston-area-neighborhoods-poses-health-risk-to-residents-new-research-finds.

[8] Germaine Williams and Tom Howard, "Highway Finance: Past, Present, and Future," *Public Roads*, Summer 1994, https://highways.dot.gov/public-roads/summer-1994/highway-finance-past-present-and-future.

[9] The Lower East Side in 1900 had a density of 1,100 people per square acre ("Housing Density: From Tenements to Towers," The Skyscraper Museum, accessed January 6, 2025, https://skyscraper.org/housing-density/history/.)

modern commuter areas in the United States such as Forest Hills[10] and in 1929, Radburn, NJ[11], a city designed to incorporate the automobile. Although the automobile was gaining support on its own, it was the decisions of government officials, no more prominent than Robert Moses who provided the pathways for automobiles to flood New York on a daily basis. In Robert Caro's seminal biography of Moses, he describes some of the car infrastructure that Moses created as expressed in the quote below (which leaves out the seven major bridges, expressways outside of New York City, housing projects, dams, parks, and recreation facilities).

> With a single exception, the East River Drive, Robert Moses built every one of those roads. He built the Major Deegan Expressway, the Van Wyck Expressway, the Sheridan Expressway, and the Bruckner Expressway. He built the Gowanus Expressway, the Prospect Expressway, the Whitestone Expressway, the Clearview Expressway, and the Throgs Neck Expressway. He built the Cross-Bronx Expressway, the Brooklyn-Queens Expressway, the Nassau Expressway, the Staten Island Expressway, and the Long Island Expressway. He built the Harlem River Drive and the West Side Highway.[12]

The embrace of automobiles led to the proliferation of long-distance commuters who relied on cities for their jobs but had otherwise isolated them from those urban centers' future and needs. Areas that may have grown into dense commuter cities of their own became (or were even designed to be) the sprawling car-focused communities that now seem ubiquitous across the country, further exacerbating suburbanite need for a car (or multiple ones). At the same time, it meant that cities would need to morph

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[10] As absurd as it may seem today, Brookyln Heights was once seen as an attractive area for early New Yorkers to escape the urban environment. It was later modeled as a commuter area, and finally today, as part of downtown Brookyln, where with 62,354 people/sq mi on 2010, it's one of the densest places on earth. ("Neighborhood – Brooklyn Heights Association," accessed February 16, 2025, https://thebha.org/neighborhood/.)

[11] John Nielsen, "Cul-de-Sacs: Suburban Dream or Dead End?," *NPR*, June 7, 2006, sec. Environment, https://www.npr.org/2006/06/07/5455743/cul-de-sacs-suburban-dream-or-dead-end.

[12] Robert A. Caro, *The Power Broker: Robert Moses and the Fall of New York*, 1st ed (New York: Vintage Books, 1975), 6.

in ways that benefited the seemingly infinite number of drivers that demanded automobile commuter accommodation through infrastructure such as parking facilities and expressways. If one wanted to live 50 miles outside of New York, it was presumed to be on the government to accommodate their need to get to their workspace in town. Distance had been conquered and the consequences of those decisions for the urban fabric had not yet been realized. Robert Moses, a man who always seemed to yearn for the quiet streets of his native New Haven, was the "power broker" who made New York City morph against its own innate needs, to benefit the wealthier, whiter suburbanites.

As we move further into this current century, a new crop of transportation methods is starting to be proposed, along with the infrastructure and government support that is necessary. In Las Vegas, Elon Musk's Boring Company is building a series of underground tunnels where autonomous Tesla vehicles will allow its passengers to bypass ground level traffic[13]. There are hundreds of companies, with approximately 10 billion dollars in combined funding, racing to capture an anticipated $23.4 billion/year market (in 2030) around Electric Vertical Take-Off and Landing (eVTOL) vehicle travel[14]. The e-scooter and e-bike market ("e-micromobility") has exploded in recent years[15], driving stronger pushes for infrastructure such as more and better bicycle lanes. Do the stakeholders involved in these decisions consider lessons from the past such as the expansion of highways in 20th century NYC? Will they be the power brokers to help direct taxpayer dollars to proliferate emerging transportation methods? Most importantly, how do they assess those new methods?

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[13] "Tunnels," The Boring Company, accessed January 6, 2025, https://www.boringcompany.com/tunnels.

[14] "eVTOL Aircraft Market Size, Share, Industry Report, Revenue Trends and Growth Drivers," MarketsandMarkets, accessed January 6, 2025, https://www.marketsandmarkets.com/Market-Reports/evtol-aircraft-market-28054110.html.

[15] "A Year of Electric Vehicle and Mobility Trends," McKinsey, accessed January 6, 2025, https://www.mckinsey.com/industries/automotive-and-assembly/our-insights/spotlight-on-mobility-trends.

The “literature review” section will look at the impact, decisions, and arguments around the infrastructure that Robert Moses built, focusing on the proposed Mid-Manhattan Expressway and the Lower Manhattan Expressway (Lomex), neither of which were ever constructed, as well as his battle over Washington Square Park with activists such as Jane Jacobs. In addition, it will rely heavily on the works of major opponents of Moses such as Jacobs and their arguments against the construction of these expressways. This strong historical basis will comprise a majority of the literature review section of this thesis and provide the background and foundation for the investigatory part of this work. An additional section of the literature review will cover the technology, concept of operations, and current acceptance of eVTOLs in urban areas.

The “research results” section will investigate how those historical lessons are being used when considering if or how to implement novel transportation methods, specifically eVTOLs. This will involve reviewing both published policies by urban governments and other stakeholders, as well as by including content from conducted interviews. The interview questions and format were determined once the literature review section was nearly complete, to have a firm direction on those retrospective aspects.

This thesis is not a critique or a celebration of eVTOLs nor automobiles. I believe that both types of transportation have some very real, wonderful applications but am not convinced that they address the problems of urban transportation and development. The expressways of Moses, those both built and unbuilt, hold important lessons for policymakers today as they begin to consider other transportation methods.

Chapter 2: Methodology

The methods used in this thesis follow a top-down approach. I have personal experience working within both the eVTOL industry and transportation advocacy as well as watching urban communities continue to make decisions (outside of eVTOLs) that contradict what I believe to be prudent urban policy. I therefore started this research with an assumed answer to the thesis question "how do cities draw on the history of introducing new technology when considering new transportation methods, such as eVTOLs?". I broke this question into two separate aspects. First, how have municipalities dealt with emerging transportation technologies in the past, and second, how do current municipalities approach emerging technologies today and do they utilize those learned lessons of the past? My hypothesis was that those lessons are still applicable today and do not tend to be formally incorporated when assessing new transportation methods.

The first aspect, the historic one, deals with a "how" question and uses a history approach to narrow in on the already large topic of New York's adoption of the automobile in the 20th century and describe the arguments and methods used against further expansion of that infrastructure. In Robert Yin's guide, *Case Study Research: Design and Methods*, this is actually the example used when describing a question that can be addressed by a case study[16] although due to the age of the particular example and the depth of research already conducted on the topic, this aspect was approached as a history rather than a case study. As Yin discusses, the case study provides much of the same basis as a history but expands to use other tools such as "documents, artifacts, interviews, and observations"[17], and in this case, interviews were used, expanding the case study beyond the historic case of automobiles in 20th century New York, to municipal decision-making when novel transportation methods are used. This thesis is therefore a case study with a large history portion and a more classic case study approach for the contemporary situation,

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[16] Robert K. Yin, *Case Study Research: Design and Methods*, 2nd ed., vol. 5, Applied Social Research Methods (Thousand Oaks: Sage, 2001), 6.

[17] Yin, 5:8.

with the strength of the link between the two being the crux of the conclusion. If I had found a strong link between the two and evidence to suggest that those dealing with eVTOLs do consider the lessons of the past, such as the experience of New York and the automobile, then my hypothesis would have been proven false. If I had found no or only a superficial link between the two, then my hypothesis would have been shown to be true.

Literature Review

The literature review section of this thesis lays the foundation in establishing the retrospective lessons that urban communities have previously encountered and that should apply as applicable for the future. There are three main parts of the literature review. The first is a short dive into urban fundamental principles and characteristics that lay the groundwork for the second aspect around historical urban policy surrounding automobiles. This initial exploration provides a background to demonstrate why American urban planners in the 20th Century missed the mark so widely when it came to assessing and properly integrating automobiles into urban environments. The focus is on urban theory writings such as Lewis Mumford's "What Is a City"[18].

In order to understand the mind of urban policy makers, this thesis explores the reasoning in theory but focuses on one particularly prominent case, that of Robert Moses' and his push toward integrating automobiles through New York City. Here, the focus is on understanding Moses' thinking when it comes to large automobile traffic and infrastructure as well as the impact of highways that Moses built. This piece is intended to be a capstone to the previous sectors, bringing them together into a detailed, real-world historic example. Theory is important in establishing a basic understanding but seeing how things work out in the past reality holds even more weight. How did urban communities and the

[18] Lewis Mumford, "What Is a City," *Architectural Record* 82.5 (1937): 59–62.

leaders within approach these new technologies at first; with hesitance or by ceding to a technological optimism? Did they feel that the automobile nurtured the urban areas or were they an application to achieve a different end? What resulting policies made decisions and how do those policies reflect on the foundational lens that was created in the first part of the literature review? These questions and those like them deduce lessons around what must be protected and nurtured within a city and what can be sacrificed. The sources to provide this larger retrospective analysis are secondary sources that draw conclusions on this topic based on the policies and the impacts. Examples of sources include Peter Norton's *Autonorama*[19], Robert Caro's *The Power Broker*, and Anthony Flint's *Wrestling with Moses*[20] In addition to these secondary sources, I reviewed various primary sources from the time period such as clips from the automobile and eVTOL industries, and editorials from newspapers, as well as Jane Jacobs' own *Death and Life of Great American Cities*[21].

Case Study and Interviews

The interview section of this thesis is the most important aspect and incorporates aspects of data collection as described in Yin's guide[22]. The other sections build the framework that this section tests against real current situations in order to answer the main thesis question. Interviews include those with stakeholders inside the community that are currently in discussions with eVTOL providers as well as those that have not been seriously approached by the eVTOL industry. Interview questions were revised

[19] Peter Norton, *Autonorama: The Illusory Promise of High-Tech Driving* (Washington, DC: Island Press, 2021).

[20] Anthony Flint, *Wrestling with Moses: How Jane Jacobs Took on New York's Master Builder and Transformed the American City* (New York: Random House, 2011).

[21] Jane Jacobs, *The Death and Life of Great American Cities*, Anniversary Edition (New York: Modern Library, 2011).

[22] Yin, *Case Study Research*, vol. 5, chap. 3.

and updated based on what was learned in the literature review section and adhered to the Tufts University IRB process, including approvals and signed consent forms by participants. My submission to the Tufts University Social, Behavior, and Educational Research IRB system was approved as "Not Human Research" and followed the protocol and guidelines I submitted and were approved in IRB ID STUDY00005008. Participants were asked to disclose their role, type of agency they work with, and the approximate size of the community they work for. Specific identifying characteristics were not sought or included in order to preserve the integrity and highest degree of candidness possible. The six planned interviews were audio-recorded for accuracy's sake but otherwise that data is not included or preserved once the relevant information is included in this study.

The case study approach to the modern situation around eVTOL adoption is not limited to interview data collection as per Yin's suggestion to use multiple sources of evidence[23]. I have reviewed and detailed the results from publications and press releases from government agencies to inform the conclusions and even the interview questions. For example, in performing the literature review, I was pleasantly surprised to find a version of the approach I was hoping for in The City of Los Angeles' Department of Transportation's Aerial Mobility Report[24]. Although this was the only type of this detailed assessment that I could find by a municipality, it plays an important role in challenging my hypothesis. In addition, data and publications from various non-governmental agencies are used and referenced regarding this case study.

I have conducted 30-minute interviews that were guided by questions in Appendix A. I have asked each individual the questions listed but used those questions to develop a conversation in order to get more feedback. I contacted a total of 27 individuals or organizations in hopes of conducting an

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[23] Yin, 5:90.

[24] Seleta Reynolds, Marcel Porras, and Smith Janna, "Aerial Mobility Report," LADOT, accessed January 7, 2025, https://ladot.lacity.gov/aerialmobilityreport.

interview, with only seven responses (I did not include one of them in this research as I was unable to get the signed consent form from the individual). There did not appear to be a pattern in response. Representatives from city governments, private businesses, departments of transportation, and regional advocacy groups all seemed equally likely to respond, with one prominent exception. I was unable to get any quasi-governmental organization to respond to a request for an interview despite contacting seven of them, some organizations multiple times, and through multiple methods (emails, online contact forms, and direct messages through LinkedIn).

My structure is designed specifically to elicit a conversation because I was unaware of what guidance is available or what municipalities are doing in this regard however these questions are intended to follow the format of Yin's guidelines around "focused interviews".[25] In some cases such as that with Interviewee #3, this format yielded surprising responses and prompted new ideas of why municipalities seem so ineffective at times.

List of Interviewees

- Interviewee #1 is a business development manager at a construction and engineering firm based in Europe and employs roughly 80 people. The firm is actively pursuing vertiport development opportunities in Texas and Florida.[26]
- Interviewee #2 is an advanced air mobility program manager at a large state's Department of Transportation. Interviewee #2 works work approximately 35 individuals within the state's aviation department. [27]

[25] Yin, *Case Study Research*, 5:84.

[26] BD Manager, Interview #1, October 23, 2024.

[27] AAM Program Manager, Interview #2, January 17, 2025.

- Interviewee #3 is a policy analyst for a councilmember in a major city on the eastern seaboard that is considering eVTOLs as a transportation method. Interviewee #3 is one of only 2 individuals who work for that particular elected official.[28]
- Interviewee #4 is an aviation planning manager at a transportation planning organization representing a large geographic area in the Southern United States (representing 9 million people).[29]
- Interviewee #5 is an urban planner that works on behalf of a large city on the US' Western Coast that is considering eVTOL usage.[30]
- Interviewee #6 is the director of a large state's Department of Transportation, overseeing multi-modal transportation focused on rail, aviation, and waterways.[31]

Limitations of this Methodology

The limitations of the methods explained here lie mainly in my own bias. The sources I select in the literature review are likely aligned with my views, simply because I find them more appealing on a subconscious level. The current policies explored in the case studies will also be subject to my internal biases, as will the interview questions and process. I willingly admit that my own bias presents the largest limitations toward the analysis and arguments presented in this thesis.

Other limitations with the literature review include my bias that the integration of cars in urban areas has been a general failure in application and so many sources do reflect this general train of thought.

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[28] Policy Analyst for Councilmember, Interview #3, January 27, 2025.

[29] Aviation Planning Manager, Interview #4, January 29, 2025.

[30] West Coast Urban Planner, Interview #5, January 30, 2025.

[31] Director of Multimodal Transport, Interview #6, February 10, 2025.

Figure 1. General Electric Ad from Metro Newsletter, a publication published in Buffalo, NY. ("These Cars Can Run on Any Fuel. Gas. Or Water. Or Even Garbage," *Metro Newsletter*, Quarter 1975, Vol. 2, No. 5 edition, https://tinyurl.com/32jthf94. Reproduced by permission from General Electric,)

It's difficult to determine if arguments against cars as the primary mode of transportation (such as the advertisements in Figure 1, from General Electric) were few or simply buried by history. The research presented here is focused entirely on the United States and sources that primarily focus on automobile adaptation in the United States and so there has been a conscious decision to limit the scope in various ways, including in geography. Options for further research comparing policies around novel transportation methods are discussed in the conclusion section of this thesis.

The historic analysis section also has its own limitations as it is only one case. Rather than act as a qualitative analysis, looking at multiple different situations and then compare and contrasting them, this sole instance is meant to apply the information determined in the previous sections and apply it to a well-known historic example. That said, relying on a single episode does not provide as much qualitative analysis as multiple cases would, but is that unnecessary to make the arguments presented in this thesis.

Chapter 3: Literature Review

> "Speed is the very epitome of modern society." - Le Corbusier quoting Émile Massard, President of the second Commission of the Municipal Council of Paris[32]

This section of the thesis addresses how and why automobiles, a novel form of transportation, were embraced by society, specifically by planners like Le Corbusier and Robert Moses in hopes of identifying similar trends with today's novel transportation forms. The literature review will start with a discussion of the proliferation of the automobile, criticisms of urban areas at the turn of the 20th Century, and dive into basic theory about what makes an urban area successful in the first place. The majority of this section will focus on Robert Moses and his push toward making New York City conducive for large flows of automobiles, and finally discussion on his battles with Jane Jacobs and other critics. Hoping to draw lessons from this history and arguments for and against novel transportation methods, how should an urban area proceed when considering new transportation methods, such as eVTOLs?"

In Le Corbusier's book *City of To-morrow* he lays out a theory and an overall plan that government officials like Robert Moses would end up implementing as described further in this thesis. Le Corbusier, like many urban theorists in the early 20th century, criticized the density of places like New York and Paris, complaining that such density was a primary cause that led to the dangerous pollution, and diseased conditions which were identified with urban areas, but more importantly for Le Corbusier, a city should be focused on business and business demands speed. Furthermore, Le Corbusier and others thought that if a modern transportation system and the density of a city were at odds, the city's dense housing and its residents should lose in order to benefit the business sector[33], producing a repeat triumph.

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[32] Le Corbusier, *The City of To-Morrow and Its Planning*, trans. Frederick Etchells, 3d ed. (New York: Dover Publications, 1987), 116.

[33] Le Corbusier, 166.

Not only would we provide a transportation network that embodied the transportation of the modern 20th century, but we would do away with the outdated, dense, old slums that comprised urban areas. Le Corbusier understood urban areas specifically the business aspects, to drive technology, urban areas "created business, and business is constantly developing the automobile, and no limit to this development can so far be seen"[34]. The automobile was a product of technology, and technology is what is dragging humanity out of a state of nature and into prosperity. Therefore, it's our physical living arrangements, in the form of urban areas, which must adapt and change to keep up. The climax of the theory laid out in *City of To-morrow* is Le Corbusier's Voisin Plan" (Figure 2, at right) which had planned to convert much of central Paris (parts of the 1st, 2nd, 3rd, and 4th arrondissements) into a series of skyscrapers and orderly streets and parks. A central stated reason for this plan was to facilitate better transportation through a central station and a 400-foot wide central "speedway"[35]. He was, as the book's translator, J.M. Richards points out, "accepting"[36] the Machine Age and what it could do for humanity.

Figure 2. Le Corbusier's Voisin Plan. (Alan Powers, "Book: Blast on the Past," *The Architectural Review* (blog), February 15, 2019, https://www.architectural-review.com/essays/books/book-blast-on-the-past. Reproduced by permission from The Le Corbusier Foundation, © Fondation Le Corbusier)

For some, like Frederich Engels, these types of plans could be seen in a very different light. For Engels, the issue was not that an improved transportation technology was an incoming tide that raised all boats but rather a device that allowed the rich to escape the poverty of urban areas. As he wrote in 1845,

> The upper bourgeoisie in remoter villas with gardens in Chorlton and Ardwick, or on the breezy heights of Cheetham Hill, Broughton, and Pendleton, in free, wholesome country air, in fine,

[34] Le Corbusier, 116.

[35] Le Corbusier, 277.

[36] I would use the phrase "enthusiastically embracing" rather than "accepting"

> comfortable homes, passed once every half or quarter hour by omnibuses going into the city And the finest part of the arrangement is this, that the members of this money aristocracy can take the shortest road through the middle of all the labouring districts to their places of business, without ever seeing that they are in the midst.[37]

For Engels, the relentless drive of technology overwhelmingly benefited the wealthy, at the expense of the poor, or in the context of planning, suburbs gained at the expense of the city. Le Corbusier makes no such overtly classist argument in *City of To-Morrow* but rather focuses on the idea that urban areas of the early 20th century were disorganized and prone to the same sort of pitfalls that plagued the government; as the Progressive Movement was cleaning up and organizing government, it was thought that there's no reason why society could not better organize its physical living spaces as well. By harnessing the power of technology and rationality, men like Le Corbusier could design more efficient, cleaner, and more civilized ways of living.

However, what Le Corbusier may not have realized at the time, was that although filth and poverty are not essential to an urban area, population density is. V. Gordon Childe's essay, "The Urban Revolution"[38] points to three major aspects that define a city, which he uses in a historical context. However, these same attributes could apply today. First, cities are a permanent settlement. In other words, the majority of people in the city stay there and there is a degree of stability in the population. Most people in the city remain there for an extended period, certainly throughout the whole day, leading to a degree of stability in the population. This principle also applies to people nearby, just as it does to the exclusion of large external populations (e.g. walls). The second aspect is that cities are dense, at least respective to other nearby areas, Lastly, urban areas have the ability to develop a surplus. Childe, an

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[37] Frederick Engels, *Condition of the Working Class in England*, trans. Florence Kelly Wischenewetzky (London: George Allen and Unwin Ltd., 1892), 46.

[38] Gordon V. Childe, "The Urban Revolution," in *The City Reader*, by Richard T. LeGates and Frederic Stout, 2nd ed. (New York: Routledge, 2000), 22.

archeologist, leaned on writing as an indicator of surplus. Some of the earliest writings we have relate to surplus tallies and business receipts. A surplus implies that there is a diversified and stable economy involving farmers bringing surplus food to make available for sale or trade, blacksmiths creating other products, and merchants tying this economy together. In addition, the surplus and efficiencies of having shared resources allows for communal infrastructure such as city walls, religion, temples and priests, government, and of course, scribes and writing. This last attribute of cities, a surplus, as evident by writing, is the effect of the first two, namely a stable, permanent settlement, and population density. Over thousands of years, this recipe of urban mechanisms resulted in the type of diverse, efficient society that is able to produce the surplus that propels civilization. Since we have gained the ability to conquer distance through modern transportation two major attributes, density and permanent settlement, have waned, thus resulting in a decrease in efficiency and surplus for populations. One needs to only read the criticisms provided by organizations such as *Strong Towns* to note the inefficiency of suburbs[39] and their reliance on chain big box stores to supplement the lack of surplus to see this effect in reverse action. Simultaneously, it is as if the value of urban areas is drained out of them to sustain the surrounding towns.

Density, for all benefits of propelling civilization for thousands of years, has its downsides as well. For as long as written history has been recorded, cities have been plagued by the effects of density. Even before the 18th Century, country retreats for nobles were prominent whether it was ancient Roman nobles having homes at Cumae or the countless country homes for English nobility. During the Industrial Revolution, cities became smog filled centers of poor laborers and almost in response (benefiting from the proliferation of the railroads) the first true commuter towns arose. Fresh or country air became a prescription for a range of illnesses and as well as a notion that a virtuous life was one as far removed

[39] "America's Growth Ponzi Scheme," Strong Towns, September 1, 2015, https://www.strongtowns.org/journal/2020/5/14/americas-growth-ponzi-scheme-md2020.

from the city as possible[40]. What could be done? Luckily, the new planning movement of the late 19th and early 20th centuries, led by Ebenezer Howard's "Garden Cities", came with technological solutions, summed up best by Sir Raymond Unwin's *Nothing Gained from Overcrowding*[41]. Urban planners and critics at the turn of the 20th Century like Howard, Unwin, and Le Corbusier argued that it was possible to distance oneself from the noise, crime, poverty, and pollution while still securing the benefits resulting from the surplus of density by simply escaping to a home in the country, thanks to the railroad and then the automobile.

Le Corbusier had an enormous impact on urban theory, and some of those ideas would come to fruition in places like Brasília[42]. In the United States, and specifically New York, it was Robert Moses who took the modernist notions of Le Corbusier and began carving New York into what was thought of as a modern city. Moses was born a year after Le Corbusier into a prosperous family in New Haven, CT. When he was nine, his family moved to New York. New York's was very different from the quiet tree-lined streets of New Haven. As Moses said, "I didn't like New York, at all. It was too big; the crowds, the noise, and the confusion were terrible. I wanted to go back to New Haven…"[43]. In addition, it was the filthy, poor, and dangerous place, characteristics that were endemic to the industrial cities of the early 20th Century. The Industrial Revolution's scars on cities had created a dangerous landscape for its inhabitants and visitors. The local municipal government was beginning to address those issues, ushering in the Progressive Era in the United States while still attempting to drive progress through technological

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[40] Lewis Mumford, *The City In History: Its Origins, Its Transformations, and Its Prospects* (New York: Harcourt, Brace, & World Inc, 1961), 458.

[41] Raymond Unwin, *Nothing Gained From Overcrowding!*, 3rd ed. (Westminister: P.S. King & Son, 1912).

[42] Stefanie Waldek, "60 Years Ago, The Modernist City of Brasília Was Built From Scratch," Architectural Digest, August 21, 2020, https://www.architecturaldigest.com/story/60-years-ago-modernist-city-brasilia-built.

[43] Caro, *The Power Broker*, 29.

development and whether he liked it or not, Moses was in the right place, at the right time to make enormous impacts on the city and society at large.

The automobile, a German invention[44], was spurred to new heights in 1913 when Henry Ford began production of his version, the Model T, on a novel assembly line[45]. The mass production of vehicles meant that the car was no longer just a luxury item owned by those who once traveled in horsed carriages but was something affordable for a growing middle class. Suddenly, car-ownership exploded (Figure 3 below). Roughly a million cars existed in 1912 and by the end of the decade the number rose to 8 million. Young city officials, architects, and urban planners like Corbusier and Moses took the position described above and threw their weight and support behind the inclusion of the automobile in their designs for communities, specifically urban areas. The automobile would become the vehicle that would allow society to move forward and succeed, breaking the relationship in which people who benefited from a city's success had to endure its ills.

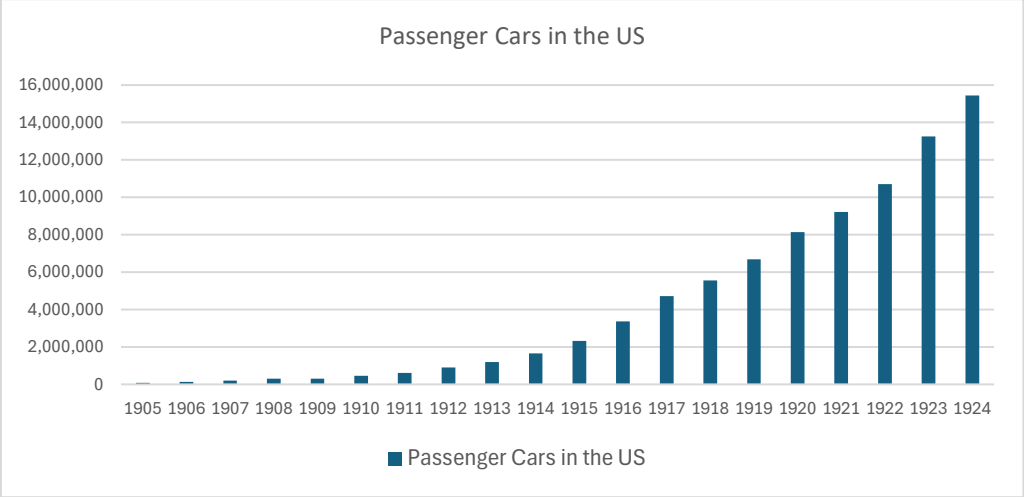

Figure 3: Car Ownership in the US, 1905-1924 (Image by author, data from Brian Redman Mitchell, *International Historical Statistics: The Americas 1750-1988*, 2nd ed (New York: Stockton Press, 1993), 577–83.)

[44] Mercedes-Benz Group, "Benz Patent Motor Car: The First Automobile (1885–1886)," Mercedes-Benz Group, accessed January 18, 2025, https://group.mercedes-benz.com/company/tradition/company-history/1885-1886.html.

[45] "The Moving Assembly Line," Ford Corporate, accessed January 18, 2025, https://corporate.ford.com/articles/history/moving-assembly-line.html.

The Role of Technology in the American Narrative

Merrit Roe Smith describes technological determinism as the idea that technology acts as the crucial agent of change in history, occupying a prominent position[46]. Rather than a "Great Man" theory[47] it's technology that drives what comes next, and this is an accelerating trend. Whereas the slow progress of invention in ancient times may not have overridden the impact of great leaders, in 2025 it's easy to watch a movie and determine if it's more than 15 years old based on whether the characters solve their problems with smartphones; technology plays an increasingly directive role in the 21st Century. The notion that technology is no longer a cog within a machine of larger forces but becomes "directing" is termed "hard technological determinism"[48]. When this prospect seems appealing, one talks of "positive technological determinism".

The United States has always been grounded in a strong sense of positive technological determinism. From its very start, founding fathers such as Franklin and Jefferson focused on the steady progress around logic, equality, material advancement, and looked toward machines to provide for a successful republic of wealth. Franklin and Jefferson both believed in maintaining a balance between prosperity (through technology) and general "betterment"[49] but certainly saw the advances in science as equating to progress, and progress as providing the fertile soils for a stable new nation. These positive notions around technology continued through the 19th Century and swelled to new heights as America industrialized and consumed the lands stretching to the Pacific Ocean. Few images display so many 19th Century American themes as John Gast's "American Progress" (Figure 4, above). In the image, playing a

[46] Merritt Roe Smith and Leo Marx, eds., *Does Technology Drive History? The Dilemma of Technological Determinism* (Cambridge, Mass.: MIT Press, 2001), ix.

[47] "The Decision Lab - Behavioral Science, Applied.," The Decision Lab, accessed February 16, 2025, https://thedecisionlab.com/reference-guide/anthropology/great-man-theory.

[48] Smith and Marx, *Does Technology Drive History?*, x.

[49] Smith and Marx, 3.

central role, is technology, represented by the railroads and the telegraph wires in the American goddess Colombia's hands. The painting unmistakably shows progress in technologies sweeping in to create change, from right to right; the Native Americans on foot, early settlers in covered wagons, and finally steam locomotives (stretching out from New York, the center of culture and technological development). The positive determinist's conclusion is that technology can allow progress, development, and culture to develop.

Figure 4. Illustration by John Gast, *American Progress*, 1872, Oil on Canvas, 29.2 cm x 10 cm, 1872, 92.126.1, Autry Museum of the American West.

Moses and the Automobile

Paradoxically, Robert Moses, despite his notorious association with the automobile industry, actually never learned to drive[50]. Except for this curious fact, Moses' opinions about progress and the automobile aligned closely with the thinking of the time[51]. Moses started his career in what was the very epicenter of Progressivism in the United States, New York City, in the early 20th Century. The end of the 19th Century was plagued with economic recessions and political scandals, and at the turn of the century a national sentiment of optimism, led by technology and a focus on equality for workers, the poor, and women, aspects that would define The Progressive Era in the United Staes. Whether it was technological progress or a sense of equality that propelled the United States to this situation (and even greater progress and

[50] Caro, *The Power Broker*, sec. photo section II, plate 14, lower bottom right corner.

[51] Many people of Moses' generation never learned to drive, especially those in urban areas.

prosperity in the following decades) lies outside the scope of this thesis. This focus on the optimistic progressivism of the turn of the 20th century is intended to highlight just how au courant Moses was with this notion. From an early age, Moses spoke of dedicating his life toward helping people, living in the service of the public.[52] To some historians, like Kenneth Jackson, Moses could very well be considered as having achieved that goal. Jackson writes that Moses' achievements in civil service but especially infrastructure allowed New York to position itself for success in the 20th Century.[53]

Part of the optimistic notion that had spread across the United States was having grand, lofty, "moonshot" style goals and Moses fit in perfectly. Within a year of starting his professional career, Moses would be leading the restructuring of New York City's corrupt civil service system which had been a long-time target for progressives. Although that particular moment in Moses' career was not an initial success[54], it did catch the eye of a burgeoning political giant, Al Smith[55], who would advance many of Moses' innovations, including a version of reform of the civil service system, but also provide him a launching pad for his role in reshaping the New York Metropolitan Area's physical infrastructure.

And so, Robert Moses, the progressive optimist, was in the right place, at the right time; in a progress-driven New York, ready to turn the page on the last century, and let technology and order ring in the new one. This headstrong mentality created many wonderous successes for Moses, but those successes would literally bulldoze much of urban New York, while figuratively upending standard urban development practices around stability and density. What distinguished Moses was his ability to get things built effectively and cut through the bureaucracy. On the other hand, his opinions on the future and on the way in which technology, specifically the automobile, and its relationship to space were in keeping

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[52] Caro, *The Power Broker*, 45.

[53] Hilary Ballon and Kenneth T. Jackson, *Robert Moses and The Modern City: The Transformation of New York* (New York: W.W. Norton, 2007), 67.

[54] Caro, *The Power Broker*, 80.

[55] Caro, 95.

with prevailing sentiments described in the preceding paragraphs. A 1958 episode of *Disneyland* best sums up in its aspirational tones this sentiment:

> The shape of our cities will change as expanded highway transportation decentralizes our population centers into vast urban areas. With the advent of wider, faster expressways, the commuter's radius will be extended many miles.[56]

A goal of the 20th Century, whether it was epitomized by Le Corbusier, Moses, or Disney (and the sponsor of the episode, The Portland Cement Association) was explicitly to change our cities in ways that decentralized them in order to literally make room for the automobile and the post-war suburban-driven lifestyle that Americans have come to expect.

Outside Disney, it is clear from planning documents and the images below just how aligned seemingly everyone was regarding the relationship between the automobile and urban areas. Norman Bel Geddes, a theatrical and industrial set designer began making mock-ups on behalf of the automotive industry titans such as Shell Oil[57] and would later design the iconic Futurama display for GM at the 1939 World's Fair as seen in Figure 5. Compare this figure with Figure 2 (Le Corbusier's Voisin Plan) and Figure 6, an image of Robert Moses' proposed Mid-Manhattan Expressway (I-495) that would run along 30th Street. These images not just lived in the imaginations of advertisers or urban

Figure 5. Norman Bel Geddes and another man looking at the General Motors Futurama model for the 1939 World's Fair. (Manuscripts and Archives Division, The New York Public Library, New York Public Library Digital Collections., accessed April 26, 2025, https://digitalcollections.nypl.org/items/5e66b3e8-cc45-d471-e040-e00a180654d7. Courtesy of New York Public Library Digital Collections.)

[56] Norton, *Autonorama*, 52.

[57] Norman Belle Geddes, *Magic Motorways*, 1st ed. (New York: Random House, 1940).

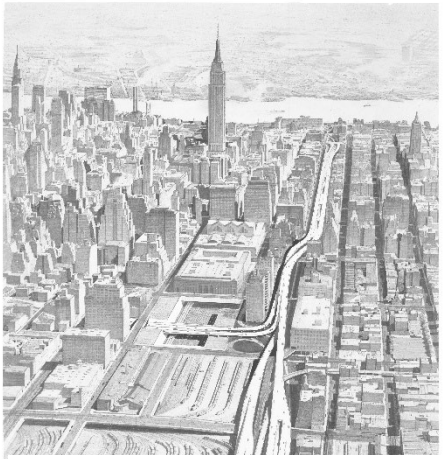

Figure 6: A mock-up of Robert Moses' planned Mid-Manhattan Expressway from Greg Goldin, Sam Lubell, and Daniel Libeskind, *Never Built New York* [New York, NY: Metropolis Books, 2016], 205. Reproduced by permission from Courtesy of MTA Bridges and Tunnels Special Archive.)

planners but obviously would manifest in countless American and Canadian cities throughout the 20th Century.

Living in the New York Metropolitan Area makes it quickly apparent that automobiles play a fundamental role. There is a seemingly endless list of automobile focused infrastructure in which Robert Moses played a pivotal role. As the quote in this study's introduction notes, Moses led the construction of countless expressways, parkways and highways as well as the seven major bridges that have been constructed which connect Manhattan to the other boroughs and the mainland. These are gigantic structures, each one of them a marvel of modern engineering and transportation. In addition to the roadways and bridges of New York, Moses led the construction of a series of parkways throughout metropolitan areas in Westchester and Long Island totaling over 400 miles[58]. This roadway network was intended to connect the urban center of New York City with the surrounding areas full of parks, which Moses also constructed. Moses' plan revolved around an entire notion of expanding the reach of the urban population through the use of the private automobile.[59]

Originally, Moses' idea was centered on providing New York residents with access to parks and beaches on Long Island, necessitating efficient pathways for automobiles out of and back to New York. This harkens back to the idea that residents needed the ability to escape the dingy urban environment; it was a plan to better the lives of New Yorkers. This original purpose was, however, quickly supplemented by other uses, mainly providing a growing bourgeoisie in the suburbs with easy pathway to the jobs and attractions of the city. No longer did living on Long Island mean that one was confined to being a farmer,

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[58] Caro, *The Power Broker*, 8.

[59] Caro, 146.

a fisherman, or a wealthy baron on vacation. Planned suburbs like Levittown (bounded by the Northern and Southern State Parkways, both created by Moses) sprung up, allowing commuters to travel into New York City for work. As journalist Brian Moss writes:

> In addition, Robert Moses' parkway projects of the 1920s and 1930s had made Nassau County much more accessible to the automobile than it had seemed before the war. Small-town life mom, Main St. and apple pie had come during the war to be idealized as the soul of America. Levitt's little houses were the city boys' opportunity to get a piece of the dream they'd been fighting for.[60]

The dense metropolis began being drained of its resources, in terms of population and capital, while bearing the externalities associated with accommodating the daily influx of the white collar (and white) workforce. By the 1950s, Moses pitched the idea for Lomex and clarified his position on cars in cities with his infamous quote: "We simply repeat that cities are created by and for traffic"[61]. Moses, in line with so many others, both those mentioned in this thesis and his contemporaries of the time like Mayor Fiorello La Guardia, championed an idea of "urban renewal"[62]. Instead of improving and nurturing the types of dynamic, multi-use neighborhoods that would be glorified in works like *The Death and Life of Great American Cities*, large public housing complexes were completed all over the city. Rather than improving upon New York's extensive subway and bus system, massive highway systems were

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[60] Brian Moss, "Levittown and The Suburban Dream of Postwar New York," *New York Daily News* (blog), August 14, 2017, https://www.nydailynews.com/2017/08/14/levittown-and-the-suburban-dream-of-postwar-new-york/.

[61] Ballon and Jackson, *Robert Moses and The Modern City: The Transformation of New York*, 70.

[62] Although whereas La Guardia envisioned this as housing for the former tenants of slums, Moses never had those notions; focusing on the gains of power from the massive amount of funding and ability to physically reshape New York into a modern city. Caro, *The Power Broker*, 611.

constructed. The city, in the context that humans had nurtured throughout millennia was to be not just updated, but replaced, with an entirely new lifestyle focused on the suburb and the automobile.

The road system that allowed for this drain of wealthy populations to leave the city left only poorer populations in many areas without the political capital to effectively advocate for the needs of their own neighborhoods. This political reality is not just a historic one. Just this past May 2024, the City of Austin and Travis County fought against the expansion of I-35 within their jurisdictions[63]. That position was successfully opposed by a vote of the Capital Area Metropolitan Planning Organization (CAMPO) which is mostly comprised of representatives from wealthy districts outside of the impacted area. Like New York before it, The City of Austin is currently at the mercy of the automobile and those that rely on it. Even in New York today, the political power against the now-implemented congestion pricing is based in the suburbs of Upstate New York, Long Island, and New Jersey, yet another example of car-driving commuters influencing urban policy[64]. Back in mid-20th Century New York, wealth drained and spread out to far flung commuter towns that have become indistinguishable from each other and where residents and visitors can only note the distinctions and qualities based on the skill of drivers and road access. Concurrently, cities without a stable population and density to provide regular interactions are drained of not only wealth but also a distinct culture. As the famous (and apocryphal) Tennessee Williams quote goes, "America only has three cities: New York, San Francisco, and New Orleans. Everywhere else is Cleveland.".

Regardless of the intended population's location, the highways Moses built were intended to facilitate the needs of the automobile-owning population at the expense of the residents who were

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[63] Nathan Bernier, "Funding Freeze for I-35 Expansion Denied in Heated CAMPO Vote," Austin Monitor, May 14, 2024, https://www.austinmonitor.com/stories/2024/05/funding-freeze-for-i-35-expansion-denied-in-heated-campo-vote/.

[64] William Finnegan, "The Politics That Derailed Congestion Pricing in New York," *The New Yorker*, June 24, 2024, https://www.newyorker.com/news/daily-comment/the-politics-that-derailed-congestion-pricing-in-new-york.

impacted[65]. Starting in 1948[66], the Cross-Bronx Expressway was constructed, connecting The George Washington Bridge, with the Whitestone and Throgs Neck Bridges, by channeling traffic through Upper Manhattan and The South Bronx, while also networking through The Greater Bronx on a web of roadways to Manhattan and Queens. The impact of the Expressway on The South Bronx was enormous[67]. In the name of 20th Century progress through modern technology, The Cross-Bronx Expressway split and even leveled entire neighborhoods. This was a lesson that New Yorkers such as Jane Jacobs would take to heart when fighting against the construction of two proposed cross-Manhattan roadways, The MME and Lomex. Nearly every city in the United States has large highways bisecting its urban center. Although not entirely spared by highways, Manhattan stands nearly alone as an example where urban bifurcation by highways has been mostly avoided. The successfully rejected MME and Lomex represent a turning point where citizens began seeing the basic fabric of what makes a city starting to disintegrate. How and why did that sentiment begin to change?

Jacobs and Greenwich Village

Robert Moses had always had his eye on Greenwich Village and the Washington Square Park area in particular. Moses had plans to reorganize the park for more efficient and higher capacity automobile traffic as early as 1935[68], when he proposed an enormous traffic circle that would surround the park. This

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[65] It was not seen as an unfortunate trade-off that entire neighborhoods would need to be eliminated, but a double-win. At the 1940 World's Fair, General Motor's Futurama exhibit's voice that is projected from a loudspeaker extols just this sentiment; "the city has been replanned around a highly developed modern traffic system, and even though it is 1960, the system as yet is not complete. Whenever possible, the rights of way of these express city thoroughfares have been so routed as to displace outmoded business sections and undesirable slum areas." (Norton, *Autonorama*., pg. 44)

[66] Alan Feuer, "Hell on Wheels, and Nerves; If Ever There Was a Mean Street, It's the Cross Bronx," *The New York Times*, September 20, 2002, sec. New York, https://www.nytimes.com/2002/09/20/nyregion/hell-on-wheels-and-nerves-if-ever-there-was-a-mean-street-it-s-the-cross-bronx.html.

[67] Caro, *The Power Broker*, 850–84.

[68] Flint, *Wrestling with Moses*, 72.

was rejected by neighborhood associations as too impactful on the area's future development and historic buildings. Moses did not relent though, returning in 1939 with a modified version of the plan (dubbed "the bathmat") that also featured a traffic encirclement, but this time with a lily pond in the center[69]. This version was also defeated. Moses' attention was continuously diverted to other projects all around New York, but he relentlessly pursued his redevelopment visions for Washington Square.

Greenwich Village, once the home of country manors which reminded their owners of Greenwich, England (itself a country escape in the 17th century), had grown up with the city[70]. Starting as a somewhat country retreat itself, starting when New Netherlands Governor Wouter van Twiller used it as a profitable tobacco farm (mark #10 in Figure 7), Greenwich Village quickly became a fashionable home for wealthy Dutch and British colonists.

Figure 7: Johannes Vingboons Map of New Amsterdam, 1639 (Illustration from Vinckeboons, Joan, and Library Of Congress. *Manatvs gelegen op de Noot sic Riuier*. 1670. Map. https://www.loc.gov/item/97683586/.)

By the turn of the 20th century, although it was still the home of some of the city's wealthiest residents, it hosted a myriad of lower classes spilling over from nearby neighborhoods such as the East Village and the Lower East Side. Through this clash of sophisticated thought and poverty, a bohemian population of writers, artists, musicians, and political activists emerged. To Moses, this vibrancy was invisible, whereas the queer street patterns were not. In 1935, Moses's redesign was akin to other successful projects that he had overseen such as Riverside Park. To him, Washington Square Park was an epicenter of disorganization, ripe for an upgraded park and more importantly, it could play a role in the city's revival in terms of automobile traffic infrastructure and flow.

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[69] Flint, 73.

[70] Flint, 67.

Washington Square Park sits at the south end of 5th Avenue and is the east anchor of the West Village neighborhood. The park is bordered by Washington Square North, which is somewhat analogous to West 6th Street. Roughly seven blocks north of the park is 14th Street and where the "village character" gives way to the far taller buildings that epitomize Manhattan. South and east of the park are Washington Square South and East, respectively, acting as a border between New York University and the park. The west side of park opens up to the larger West Village and is bordered by Washington Square West. Within the park's seven acres exist various dog runs, a statue of Garibaldi, a historic tree known as Hangman's Elm (although no hangings have ever been confirmed), and of course, the park's iconic arch and central water fountain. Although New York boasts countless parks steeped in history, few have played such a significant role as Washington Square. Created in the early 1800s out of what was a mass gravesite from previous epidemics[71], the park was created to mirror the stately squares of London. Originally it was mainly used as a parade ground and seen as a front lawn for the wealthy bordering residents. By the 1900s, like the larger Greenwich Village around it, it had become an epicenter of political activity, protests, and culture but for many nearby residents like Jacobs, it was just a park where people could bring their kids to play, sit and watch the world.

Washington Square Park long had a road in it, although it was mostly used as a bus turnaround. Moses saw the park as a transit junction between the traffic of midtown (and the proposed MME) and the proposed Lomex. To accomplish this connection, Moses had proposed a 4-lane bidirectional arterial[72]. Compared to the list of projects that Moses had already completed, this seemed like a "walk in the park".

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[71]It's believed that there are still 20,000 corpses buried under the park (Flint, 67.)

[72] Flint, 75.

Figure 8 shows Moses' 1955 plan, which includes the four-lane highway (with one direction going through the iconic Washington Square Arch), a repositioned fountain, and a pedestrian walkway intended to appear much more prominent in the illustration than it would ever be in reality.

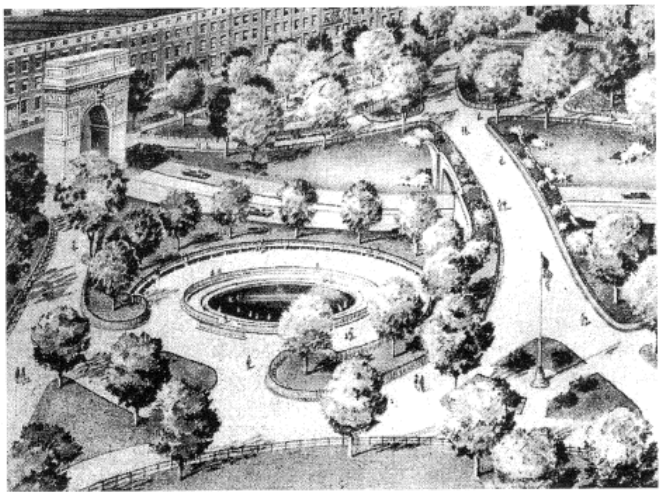

Figure 8. Robert Moses' Vision for Washington Square Park from Ballon and Jackson, *Robert Moses and The Modern City: The Transformation of New York*, 125.

Moses had made a critical error though, in his arrogance and determination to simply get things built though a variety of political and social maneuvering: he had left his flank open to attacks on the policy itself. This was no longer the era of Le Corbusier and although the general tide was, and still very much with the automobile industry, new urbanism was beginning to develop from the ground up. The era of big infrastructure projects was beginning to wane and a dawning of counterculture, perhaps non-coincidentally focused on the West Village, was beginning to rise. To Moses "cities are built for and by cars", Jane Jacobs would respond that cities are "by and for neighborhoods".[73] Jacobs' *Death and Life of Great American Cities*, embodies this mentality. Rather than writing as a pedantic academic intellectual, Jacobs wrote in a way that was based on her observations and opinions. It came off as a commonsense way of writing that was easily understood by the average reader. Understanding Jacobs did not require high-minded knowledge of how technology has impacted the rise of civilizations or detailed understanding of transportation, rather the reader enjoys simple observations like the importance of a central feature like a fountain in a park[74] or that mixed use neighborhoods created a dynamic 24-hour day environment (as described in the beautiful

[73] Ballon and Jackson, *Robert Moses and The Modern City: The Transformation of New York*, 70.

[74] Jacobs, *The Death and Life of Great American Cities*, 136.

"sidewalk ballet" passage[75]). Similarly, her approach with other neighborhood mothers was based on the needs of the residents, not on a larger plan for the metropolitan area. Her ideas rested on the innate knowledge that had been gained through 10,000 years of humans living in close urban quarters. It was a bunch of mothers who jumpstarted the pushback against these large urban automobile projects by attacking the underlying principles.

In Jacobs' writing, she points out several damning aspects of Moses' various plans. In discussion of Lomex, Jacobs discusses the unintended downstream impacts. Yes, she concedes, a highway would make traffic flow easier into and out of Manhattan, but it comes with a "spaghetti-dish of ramps"[76] that then dump traffic into Manhattan, therefore eating up real estate and pouring traffic into an area that is not sufficiently large for it to handle. In addition, Jacobs notes that Moses makes no mention of parking and without dedicated parking, cars then create additional traffic as they circle the streets looking for it.[77]

It is of note that neither Jacobs nor Lewis Mumford, a contemporary writer at the time who often wrote about cities, were necessarily anti-automobile. Both individuals saw automobiles as necessary forms of transportation, particularly trucks as conveyances for goods and services. As Jacobs says, "we blame automobiles too much"[78]. In Chapter 18 of *Death and Life of Great American Cities*, she explains that it is not the application of the automobile but rather the over-application of it. Trucks for instance, do wonders at conveying mass goods to a variety of locations efficiently. Taxis too are wonderful uses of automobiles as they're far more efficient than personally owned cars. However, by replacing horses with automobiles, we have simply traded one form of clogged, dangerous traffic with another. Jacobs saw the inevitable trade-off between private automobiles and city density, noting that the city was prone to

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[75] Jacobs, 66.

[76] Jacobs, 478.

[77] For an excellent discussion into urban parking, see Henry Grabar's *Paved Paradise: How Parking Explains the World* (New York: Penguin Press, 2023)

[78] Jacobs, *The Death and Life of Great American Cities*, 440.

"attrition by automobile"[79]. When a society decides to optimize aspects for one beneficiary, in this case, the automobile, all other aspects shall bear the burden, whether that is a neighborhood declared a slum or a park where Jacobs took her children. Today, this situation is further exacerbated due to the increased size of vehicles and reduced pedestrian infrastructure.

When Manhattan Borough President Hulan Jack suggested a 36-foot roadway as a compromise, Moses shot back that only a 48-foot roadway would do. He had fought and won battles over projects from experts and officials ranging all the way up to sitting President Roosevelt[80]. He wouldn't capitulate to a mere Borough President, so giving in to a bunch of area women in an area he had deemed necessary for renewal anyway? Out of the question. The women were led not by Jacobs but by Shirley Hayes. While Jacobs may have focused her attack on urban theory, Hayes focused on tactics[81]. For Hayes, there was no middle ground. While others like Jack were pushing for smaller roadways, for Hayes no roadway through the park was the only option. This position enforced the attack on the underlying theory that Moses' used to gather power and complete his massive projects. Without that underlying theory and the public understanding and support for his projects, his power rapidly evaporated. A roadway through a park was still a roadway and all but negated the point of such a park. There could be no capitulation on that fact and when confronted with this pushback, Moses was incensed, shouting at a public hearing "There is nobody against this – NOBOBY, NOBODY, NOBODY, but a bunch of, a bunch of MOTHERS", as recounted by Jane Jacobs.[82]

Those mothers would bring down Robert Moses after so many had tried and failed. After their initial protests, they had gotten the attention of the new alternative newspaper in the area, *The Village*

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[79] Jacobs, 447.

[80] Ballon and Jackson, *Robert Moses and The Modern City: The Transformation of New York*, 126.

[81] Flint, *Wrestling with Moses*, 76.

[82] Ballon and Jackson, *Robert Moses and The Modern City: The Transformation of New York*, 127.

Voice, which focused on the proposed project and the overall theory and practices of Moses[83], which then gained additional public support and subsequently those of elected officials. On November 1, 1958, Washington Square was closed to traffic thanks to the pushback from Jacobs, Hayes, and others. Moses had suffered his first serious defeat since he was defeated in his only run for public office in 1934 when he ran for Governor of New York[84]. Unlike the defeat of 1934, Moses would not recover this time.

The MME was designed to be a classic Le Corbusier-style design; a six-lane elevated highway running from The Lincoln Tunnel to the Queens Midtown Tunnel, it would feature buildings built into and on top of the roadway. Like the roadway through Washington Square Park, Moses had pitched this idea many times, starting in the early 1940s (when he would also start campaigning for Lomex). The MME faced not a band of local residents but powerful local businessmen, mainly the Associated Fur Manufacturers (representing 20,000 workers)[85]. As Midtown Manhattan grew, so did the opposition and the impossibility of the project. Revisions to narrow the roadway or put it underground were met with pushback from Moses. Eventually, in 1965, Mayor John Lindsey killed the project for good. [86]

Unlike The MME, The Lomex Project faced a much more familiar set of tactics to those Moses faced in Washington Square Park. Jacobs appeared again as a prominent voice, being urged on by Lomex's version of Shirley Hayes, Father Gerard La Mountain, to be the opposition's mouthpiece[87]. Unlike The MME, there were not large business interests in the areas that were to be impacted (the impacted area would include parts of Little Italy, Chinatown, and the Lower East Side). These areas mainly had small businesses ran by immigrants, living in dense poor neighborhoods. In 1962, La

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[83] Flint, *Wrestling with Moses*, 84.

[84] Flint, 87.

[85] Flint, 143

[86] Flint, 145

[87] Flint, 146.

Mountain recruited Jacobs, fresh off her victory at Washington Square to lead the effort. Jacobs used her new-found popularity to gain the attention of the press (including occasional adversary Lewis Mumford, at *The New Yorker*) and even a young Bob Dylan wrote a song about it.[88] Through a series of public meetings throughout the 1960s, the general wave of support grew until finally, in 1969, Lomex was canceled by again, Mayor John Lindsey, and 2 years later, Governor Nelson Rockefeller dropped the project from the list of those that would be eligible for federal funding.

As obvious as that may sound to the reader today, New York City in the first half of the 20th Century ran on political favors and quiet strong influence behind the scenes, and no one was better at those tactics than Robert Moses himself. After suffering a series of failures throughout the 1960s, such as the public outcry against the destruction of the original Pennsylvania Station[89], his mismanagement of the 1964 World's Fair[90], and various positions (like racism[91] he took, the last major Robert Moses project, a bridge spanning the Long Island Sound was canceled by Rockefeller in 1973. [92]

The 21st Century's Automobile

Electric Vertical Take-Off and Landing (eVTOL) aircraft are often conceptualized as a form of urban taxi or even as the backbone of science fiction, the flying car. They are not necessarily that but rather an amalgamation of advanced technologies that allow for what the industry has termed "Advanced Air Mobility" or AAM. This future state of a vehicle targets a more distributed, personalized form of air

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[88] Flint, 155.

[89] Flint, 130.

[90] Caro, *The Power Broker*, 1114.

[91] Caro, 242.

[92] Caro, 178

travel, almost by necessity, since the electric technology is not yet advanced enough to power standard commercial aircraft. The "Vertical Take-Off and Landing" portion of the term refers to the fact that the Concept of Operations (CONOPs) involves these vehicles flying in areas that don't have room for runways, typically urban areas. Some vehicles referred to as eVTOLs do use a concept referred to as "Short Take-Off and Landing" or STOL, which pictures these vehicles taking off on ultra-short runways such as parking garage rooftops. Although there is a plethora of use cases for eVTOLs, in the most popular scenarios these vehicles are used as passenger taxis or to transport cargo around an urban area in a concept referred to as Urban Air Mobility (UAM). Bain & Company estimated in July 2024 that there will be 45,000 eVTOLs by 2040.[93]

The history and current status of similar aviation uses feature helicopters in places like Sao Paulo, where there are over 400 privately owned helicopters[94], the most in the world. Sao Paulo, a city of enormous inequality and congestion provides the backdrop for the city's wealthy to navigate more easily via rooftop-to-rooftop transportation. In 1977 a Sikorsky S-61L helicopter accident on the rooftop of the Pam Am Building in New York killed 5, including one individual on the street below, effectively ending commercial helicopter use in Manhattan[95]. With those aspects in mind, travel in an urban area presents significant social and safety challenges that the industry is working hard to overcome.

Joby Aviation, often seen as the frontrunner in the eVTOL space, prominently features flights from Manhattan's downtown heliport near the South Street Seaport to JFK on their website, boosting that

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[93] Mattia Celli, Jan Schmidt, and Jim Harris, "Advanced Air Mobility: What Electric Air Taxis Need to Take Off," Bain and Company, July 2024, https://www.bain.com/insights/advanced-air-mobility-what-electric-air-taxis-need-to-take-off/.

[94] BisAviation, "The Capital of São Paulo Has the Largest Fleet of Helicopters in the World," *BisAviation Group* (blog), May 9, 2022, https://bisaviation.com.br/the-capital-of-sao-paulo-has-the-largest-fleet-of-helicopters-in-the-world/.

[95] Robert D. McFadden, "5 Killed as Gopter on Pan Am Building: Throws Rotor Blade," *The New York Times*, May 17, 1977, Late City Edition edition, sec. Front Page, https://www.nytimes.com/1977/05/17/archives/5-killed-as-copter-on-pan-am-building-throws-rotor-blade-one-victim.html.

it would reduce the 49-minute car ride to only 7 minutes and has already flown test flights from the Downtown helipad to New Jersey[96]. Eve Air Mobility, another company, based in Brazil, talks of similar transit experiences that take the place of cars in Rio de Janeiro[97]. Wisk, a subsidiary of Boeing that is focused on certifying the first autonomous commercial aircraft that will also be an eVTOL has formed a partnership with the city of Sugar Land, TX which is located in the Houston Metro Area[98][99].

The vehicle itself is not a concern for this study. The manufacturers of these vehicles and certifying agencies like the Federal Aviation Administration are focused on ensuring that the vehicles provide a safe mode of transportation for passengers and other stakeholders (like those on the ground). eVTOLs are likely to be safer than standard aircraft once certified due to the advanced technologies involved. The concern of this study is what are eVTOLs, as a novel form of transportation going to do to the overall transportation network and city itself? Will they be equitable in terms of accessibility or will these be modes of transportation used by the wealthy (such as helicopters in Sao Paulo)? What are the perceived externalities in urban areas in terms of noise and vibration? What about air restrictions on building heights? Will eVTOLs lead to an "induced demand" of traffic, either in the airways or even on the ground (as passengers travel to urban heliports, termed "vertiports")? What impact will vertiports have on surrounding neighborhoods? Do eVTOLs address a transportation need or is it another case where government decision-makers are being convinced by a "Futurama" for the 21st Century? *Who* makes these decisions within a municipality and how do they arrive at those decisions?

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[96] "Joby Flies Quiet Electric Air Taxi in New York City," Joby, November 13, 2023, https://www.jobyaviation.com/news/joby-flies-quiet-electric-air-taxi-new-york-city/.

[97] "A Collaboration Led by Eve Publishes Concept of Operations for Urban Air Mobility in Rio de Janeiro," Eve Air Mobility, May 4, 2022, https://www.eveairmobility.com/a-collaboration-led-by-eve-publishes-concept-of-operations-for-urban-air-mobility-in-rio-de-janeiro/.

[98] Houston is no stranger to aerospace pioneering, given that it's the home of the NASA Amstrong Flight Research Center.

[99] "Wisk and the City of Sugar Land, Texas, Partner to Bring Autonomous Air Taxis to the Greater Houston Region," Wisk, January 21, 2024, https://wisk.aero/news/press-release/wisk-sugar-land/.

Although there is plenty of information from vertiport companies on their infrastructure's capabilities in handling advanced AAM aircraft, there is a surprising lack of information related to how they will mitigate impact to the local community or even benefit that community. This is not surprising. It was not up to The Ford Motor Company to ensure that a highway did or did not get built, but up to local, state, and federal governments to do so. On the contrary, at least one municipality, Los Angeles, has already developed a detailed plan for eVTOLs, covering a wide range of topics including vertiport development, phase implementation, flight paths, and interaction with other transportation methods[100]. This model will be used to understand the current concerns as well as shortcomings and areas for development. It is encouraging to see Los Angeles include a section titled "Impact from Legacy Decisions" but the section is limited and focuses on air traffic routes, not infrastructure creation. Does the City of Los Angeles feel adequately prepared with the framework that they have created? Why haven't other target cities followed suit with a similar set of guidelines?

I currently work for Aurora Flight Sciences, a subsidiary of The Boeing Company, and I act as the liaison between Aurora and Wisk, another branch of The Boeing Company that focuses on designing and building eVTOLs. eVTOLs are groundbreaking advances in aviation, merging several emerging technologies; light composite materials, powerful electric batteries and distributed propulsion systems, and in some cases (including Wisk) autonomous flight. eVTOLs are better small aviation vehicles simply on the basis of technological advancement. They are cleaner for the environment, they are more accessible due to the lack of an on-board trained pilot, and, with the anticipated CONOPs, they can interact more predictably within aviation networks. Despite the number of advantages stated above, there may be some technological challenges, as well as concerns around noise levels (eVTOLs typically have multiple sets of rotors), contingency scenarios, and passenger experience. I envision a wide range of uses for eVTOLs, including access remote areas, emergency service use, and contributing toward a distributed

[100] Seleta Reynolds, Marcel Porras, and Janna Smith, "Urban Air Mobility: Policy Framework Considerations," LADOT, September 13, 2021, https://ladot.lacity.gov/aerialmobilityreport.

airport system[101]. The most popular visions of eVTOLs and the larger network, UAM, often see these vehicles providing "air taxi" services within a city. It is in versions of this popular visualization that I see a successfully implementation to be a challenge and potentially fitting in some of the negative trappings that were described in preceding sections. In this regard, the next section will highlight some of my concerns as well as discussions with a variety of individuals who will influence how and why eVTOLs will operate within our urban areas.

How Municipalities Make Decisions

How do municipalities make decisions around new transportation technologies or new technologies in general? Authors Stefano Moroni and Daniele Chiffi note that municipalities face decisions that have large levels of uncertainty due to the complexity of an urban environment and that those decisions have life-altering impacts for the residents of cities, while the decisions are difficult to reverse due to the permanence of physical infrastructure[102]. Of course, with over 90,000 local governments[103] in the United States, there is a gradient of quality when it comes to decision-making. Moroni and Chiffi note that because of the severity of decision-making, an evolutionary approach[104] is

[101] Current airports are set up in a "hub and spoke" system where an overwhelming majority of passengers use only 30 airports around the country. Leveraging eVTOLs and other Regional Air Mobility (RAM) products could distribute this traffic into a system that is more a better experience for users and more efficient use of resources. For more information, see NASA's report on RAM (Kevin Antcliff et al., "Regional Air Mobility" (NASA, April 2021), https://sacd.larc.nasa.gov/wp-content/uploads/sites/167/2021/04/2021-04-20-RAM.pdf.)

[102] Stefano Moroni and Daniele Chiffi, "Uncertainty and Planning: Cities, Technologies and Public Decision-Making," *Perspectives on Science* 30, no. 2 (April 2, 2022): 237–59, https://doi.org/10.1162/posc_a_00413.

[103] "Local Governments in the U.S.: A Breakdown by Number and Type," accessed March 3, 2025, https://www.stlouisfed.org/publications/regional-economist/2024/march/local-governments-us-number-type.

[104] As opposed to a *constructivist approach*, one where systems are designed for a particular purpose. This sentiment seems to rhyme with Lewis Mumford's term "monotechnic" described in the next section in that both notions will box in organic development.

preferred, along with a preference for negative rules or rules that prevent externalities rather than recommending certain solutions.

Regarding technology, the authors lean on the aspect of negative rules rather than directive ones. For example, they suggest that municipalities should make rules preventing externalities such as pollution or perhaps more relevant to this thesis, preventing impact to the flow of pedestrians, rather than embrace a specific technology that may have unintentional impacts.

> First, if the public decision-maker does not promote general, stable and mainly negative rules that express clear and simple aims, such as avoiding certain specific, well-defined negative externalities, then individuals are very likely to be uncertain about the proper selection and adoption of any specific technology that may comply with public aims; this is a kind of unreduced double uncertainty affecting both public decision-makers and individuals.[105]

This recommendation on how municipalities should make decisions (or rather not but create guidelines) lays the important groundwork for the next step that municipalities could take, which is assessing the impact of the new technology. If the first prescription, a slow evolutionary approach, is followed, then municipalities will have the opportunity to better assess and utilize a technology that fits their needs. In the case of the automobile, negative rules around maintaining the city's fabric (a version of what Jane Jacobs was promoting) and a slower pace of infrastructure creation may have avoided some of the negative impacts. For eVTOLs, it's not too late and reports like Los Angeles' Aerial Mobility Report do create a framework of negative rules to attempt to convey what solutions will best fit while preserving what is restricted from impact.

This literature review provided the background of the incredible infrastructure that was constructed in support of large flows of automobiles and highlighted the necessary conflict between

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[105] Moroni and Chiffi, "Uncertainty and Planning," 249.

automobiles and urban density, specifically in the New York City Metropolitan Area. In discussion of critics such as Jane Jacobs, these arguments were again highlighted and tactics to fight against further automobile infrastructure were noted. Finally, it presented a framework on how communities should approach policy formation and specifically around new forms of technology. In the next section, I will proceed to the results from interviews with those involved in the construction of the eVTOL industry and how they approach the successful implementation of that transportation system within an urban environment.

Chapter 4: Research Results

Lewis Mumford referred to automobiles and their users as being "monotechnic". According to Lewis, monotechnics are technologies that focus on power and efficiency. Mumford's discussion was focused on larger historic trends[106] and critiquing the use or increasing trend toward monotechnics. Monotechnics are fast to embrace as they solve specific problems quickly but then create problems as they contort other systems to their own goals. Regarding motor cars, Mumford notes that they are an example of monotechnics, technologies that although they're geared toward efficiency for themselves, aren't designed to fit into a larger system and therefore the overall system becomes more brittle and less efficient.[107] In describing another monotechnic, the designed neighborhood, he states:

> The power system admits only one kind of complexity, that which conforms to its own method and belongs to the current period: a system so uniform that its components are in effect interchangeable parts, conceived as if by a single collective mind.[108]

This lens of "technics" influenced this thesis' research and direction and in doing so, provided a backdrop for critique of the application of developing transportation methods such as the automobile. Robert Moses' embrace of the automobile in New York shaped the city in enormous ways. The focus of this portion of this thesis will review the process and policy formation made by communities around eVTOLs. This will be based on both published policies as well as interviews I have conducted at the conclusion of the literature review. The goal of this section is to determine how cities are approaching the incorporation of eVTOLs, and how it mirrors or differs from their approach to the automobile.

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[106] Mumford discussed how society has been moving toward more "monotechnics" and specialized systems

[107] Mumford Lewis, *The Pentagon of Power*, vol. 2, The Myth of the Machine (New York: Harcourt, Brace, & World Inc, 1964), 140.

[108] Lewis, 2:158.

Recently, I drove from Upstate New York to Brooklyn and after traveling across The George Washington Bridge, I took the exit for the Harlem River Drive, then I was met with a series of signs offering me exits for the RFK Bridge and the Bruckner Expressway. After crossing the RFK Bridge, I merged onto the Brooklyn-Queens Expressway which passes within a few hundred yards of my home. From the moment I entered New York until I was nearly home, I was traveling exclusively on a path designed by Robert Moses 70-80 years ago. Moses' legacy and the impact of the automobile on New York is enormous and long-lasting.

Interview Summary and Overview

During the course of this thesis, I performed six interviews which are summarized in the table located in Appendix B (Table Summary of Interviews). Out of the six interviews conducted, two were conducted with individuals representing a city directly, three were conducted with individuals representing larger governmental bodies (two at State Department of Transportations and a transportation planning organization), one was conducted with a vertiport developer, and one with a private consultant focused on the industry. The interviews conducted largely supported my hypothesis that municipalities do not tend to formally incorporate historical lessons when assessing new transportation methods. This is for a variety of reasons which are discussed in the following pages of this chapter and in the conclusion. This section is also accompanied by commentary provided by other individuals considered for interviews, and information publicly available from vehicle manufacturers.

Narrative of Interview Highlights and Supplemental Material

One of the interviews was with a policy expert that is on the staff of a member of a major city on the eastern seaboard. During the interview,[109] I brought up the topic of Moses' impact on the infrastructure of New York and the interviewee stated that much of the legacy of Moses is mixed up with

[109] Policy Analyst for Councilmember, Interview #3.

the infrastructure of hundreds of years of other projects in the territory. Although I agree with the analyst, after telling them of my recent trip, they agreed that the physical infrastructure of Moses is monumental and the conversation shifted to another aspect of Moses' legacy, one which I had not anticipated. A large part of Moses' success was due to the way he had set up the organizations he oversaw, operating in a quasi-governmental fashion. This allowed organizations like the Triborough Bridge Authority (often referred to simply as "Triborough") to operate with some level of autonomy as it was funded by revenue from tolls. The quasi-governmental model that Triborough used has since been expanded and perfected by agencies such as the New York City Economic Development Corporation (NYCEDU), which oversees the development of facilities such as the Downtown Manhattan Heliport for use of eVTOLs. As the analyst stated, much of the policy direction is made and developed by quasi-governmental organizations such as these, leaving elected officials such as councilmembers in a position where they are not quite looped in and forced into a more reactionary position. This was a very interesting and enlightening direction that this research took and a great path for future studies on the role quasi-governmental organizations play in the development of local urban planning.

Other interviews that I performed added additional feedback in support of my thesis including a discussion with Interviewee #5[110] regarding eVTOLs and particularly identifying the specific problem that is being addressed. This individual said that they were not sure what problem is exactly being solved and there are significant infrastructure challenges and questions around building both vertiports and the overall communications between the vehicles. Per the interviewee, the city involved is "not the ones trying to get it moving…we're literally being brought proposal after proposal by OEMs (Original Equipment Manufacturers) and we're kind of like…what problem does this solve for us? And we don't get a lot of responses to that question". The interviewee expressed that eVTOLs and autonomous aviation in general does seem very promising for more isolated communities (noting the Choctaw Nation in

[110] West Coast Urban Planner, Interview #5.

Oklahoma) and monitoring invasive vegetation on inaccessible cliffsides. Interviewee #5's responses seemed to mirror what this thesis states about technological development being the driver of progress, regardless of if it actually matches a problem that needs solving. This line of thinking seemed similar to the retrospective questions an urban planner or a community activist like Jane Jacobs would pose to Robert Moses' plans. However, the direct comparison was not made between automobile infrastructure and proposed eVTOL infrastructure.

Out of the six interviewees, only one interviewee seemed to address the concern posed by this thesis (Interviewee #5) while the other interviewees seemed to imply that their hands were tied or were focused on developing these technologies as quickly (and safely) as possible. It was almost a given to each of the other interviewees that this technology is to be implemented, and the best action now was to simply prepare for it. Overall, no interviewee suggested that they were leaning on the lessons of the past, particularly with Robert Moses and the mass adoption of the automobile. Interviewee #5 did seem closely aligned on this point philosophically and the publications that Interviewee #5 have been involved in reflect that larger consideration of impacts on a community than simply trying to build simply one more lane (this time, in the sky). This sentiment is echoed in testimony provided to Congress by Clint Harper, another independent consultant in the AAM space who expressed that municipalities often find themselves being reactionary in understanding the impacts of new technologies rather than being at the forefront in searching for a (technological) solution to a transportation problem.

> Unfortunately, cities had grown weary of new mobility technologies. Ride-sharing services and electric scooters launched and scaled rapidly in cities in 2012 and 2017. Without collaboration and an opportunity to properly plan, cities struggled to understand the impacts on safety, the

> environment, and infrastructure. These events flagged a need for cities to understand and prepare for new mobility technology, such as AAM, while also protecting community interests.[111]

As Interviewee #5 states, "forcing us to find a solution (to integrate eVTOLs) is not the best approach and also we have a lot of other pressing issues that are major problems in the city at this time, rather than finding a place for this." and they hit on the idea of opportunity costs. In New York City, Moses' plans for the MME and Lomax took a direction that would have eviscerated tens of thousands of homes, entire neighborhoods in fact, implementing physically divisive highways across Manhattan, burdening residents with dangerous streets and more externalities like pollution. Even more so, it would have had a similar impact regarding a drain of public transit funding in favor of road and highway infrastructure as seen in nearly all cities across America. This battle pits a need for faster, more personal travel against many other aspects that make a city successful, such as efficient transportation of millions of people. During New York's "Moses Years" the State of New York diverted money toward highways, it reduced funding for public transit. As Caro wrote:

> Pour public investment in the improvement of highways while doing nothing to improve mass transit lines, and there could be only one outcome: those lines would lose more and more passengers: those losses would make it more and more difficult for their owners to sustain services and maintenance: service and maintenance would decide: the decline would cost the line more passengers: the loss in passengers would further accelerate the rate of decline….[112]

It's not simply that the MME or Lomax would take up physical space, destroying housing, and existing transportation infrastructure or that it would create sudden divisions across a city that make the

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[111] "FAA Reauthorization: Harnessing the Evolution of Flight to Deliver for the American People" (2167 Rayburn House Office Building, March 30, 2023), https://transportation.house.gov/calendar/eventsingle.aspx?EventID=406240.

[112] Caro, *The Power Broker*, 898.

walkability of a city challenging, it's that it would take the funding from an otherwise functional public transportation system and divert that to something less efficient. Are eVTOLs doomed to follow a similar path? No.

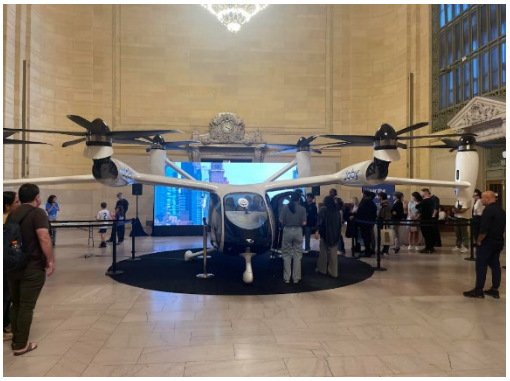
Figure 9. Author's Photo of Joby Publicity Event

eVTOLs utilize a wide range of developing technologies combined into one vehicle to deliver a host of new potential operations. While Joby Aviation, often seen as the front-runner in the eVTOL development race, prominently pitches a CONOPs where the vehicle is meant to reduce a trip from Lower Manhattan to JFK Airport from 49 minutes to 7[113], it's not highlighting the incredible technology inside the vehicle, focusing on the concept of an urban taxi (as highlighted in publicity events such as one held in Grand Central Station that I attended as seen in Figure 9). Joby uses a distributed propulsion system to feed six different rotors. The fuel system is a hydrogen-powered fuel cell system that extends the vehicle's range by nearly 5-fold over if it was simply a standard battery-powered aircraft[114], while still qualifying as a zero-emissions vehicle. The electric motors and aerodynamic model of the aircraft means that, per industry magazine AviationWeek, "*"The aircraft made only a partially perceptible sound that, in this editor's view, would almost certainly be undetectable against the everyday noise background of an urban environment."*[115].

Other eVTOL manufacturers are focused on other capabilities. Wisk Aero (a subsidiary of The Boeing Company, my employer) incorporates similar aspects to Joby's vehicle, while also focusing on

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[113] "Joby Aviation | Joby," accessed February 3, 2025, https://www.jobyaviation.com/.

[114] "Why Hydrogen Makes Sense for Aviation | Joby," accessed February 3, 2025, https://www.jobyaviation.com/blog/why-hydrogen-makes-sense-for-aviation/.

[115] "Joby Hits Range, Noise Targets On Road To Certification | Aviation Week Network," accessed February 3, 2025, https://aviationweek.com/aerospace/advanced-air-mobility/joby-hits-range-noise-targets-road-certification.

being the first to certify an autonomous passenger-carrying commercial vehicle, reducing the need for a pilot and associated human-driven errors[116]. Electra, a start-up based in Viriginia is approaching the industry with a "Short Take-Off and Landing Vehicle" (STOL) vehicle, where this small electric aircraft requires only the length of an American football field to take off, which relieves it from the power-intensive vertical lift phase of a vehicle while still having a small footprint. The vehicle also features a hybrid-electric (and battery-only option) fuel system so it can also claim a low emissions and low noise qualifier[117].

These technologies are incredibly exciting as they're not monotechnics and can be applied to other aviation platforms and in the case of autonomy and battery technology, elsewhere in society. Their success does not depend on the success or failure of the "urban taxi" model as these more core technologies could be applied to a wide set of transportation problems. For example, Electra Aero is discussing with several universities how to scale up their technology to larger aircraft[118]. This approach (and other efforts such as NASA's EPFD program[119]) means that the United States could better utilize the over 3,300 public-use airports[120], which is currently siloed into a more restrictive aviation model due to the need of large aircraft working between the 31 major airports in the United States. Likewise, developments in autonomy at Wisk could be applied to the larger aviation industry (given that Wisk is part of Boeing), making aircraft flights less prone to human-error. eVTOLs themselves could be excellent resources for remote communities that are difficult to access for road traffic due to infrastructure issues or

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[116] "Autonomy," Wisk, accessed February 3, 2025, https://wisk.aero/autonomy/.

[117] "Home | Electra.Aero," accessed February 3, 2025, https://www.electra.aero/.

[118] "Technology | Electra.Aero," accessed February 3, 2025, https://www.electra.aero/technology.

[119] "Electrified Powertrain Flight Demonstration (EPFD) Project," accessed February 3, 2025, https://www.nasa.gov/directorates/armd/iasp/epfd/.

[120] "National Plan of Integrated Airport Systems (NPIAS) - Current | Federal Aviation Administration," accessed February 3, 2025, https://www.faa.gov/airports/planning_capacity/npias/current.

natural disasters. Interviewee #2, a program manager with a state's Department of Transportation notes that many of their state's localities and municipalities are isolated from major highways due to the rugged terrain of part of the state[121]. Their organization sees advances such as drones and AAM as providing access to these communities for logistics but also in times of natural disasters. Helicopters are far more difficult and expensive to operate and maintain than many of the proposed AAM products. The interviewee did not reference recent hurricanes, but I could not help but visualize the potential help that AAM could provide communities in places such as where recent Hurricane Helena had struck; isolated mountain towns with access that was washed out.

Speaking with some interviewees, this excitement around the core technologies was obvious. Speaking with Interviewee #4, the interviewee stated that their goal is to integrate these new technologies into the larger aviation industry. They see autonomy coming and they want their region to be in the lead of the development. This provides local universities with the opportunity to be at the heart of that network. Interviewee #4 is very focused on ensuring that these different entities, vehicle manufacturers, governments of local cities and counties, vertiport firms, universities, and regulating bodies like the FAA are interacting and speaking with each other. To address the question of are eVTOLs a worthwhile technology to pursue, for private industries, absolutely, given the number of underlying technologies. For communities, universities, and universities, eVTOLs provide an excellent platform for the development and testing of these technologies on a smaller, distributed scale, with potential massive benefits and applications. This is undeniable, but it does not address the question posed by this thesis; *Are those lessons applicable today and are they being used when considering new transportation methods, such as eVTOLs?*

The diverse selection of interviewees reveals key insights into decision-making dynamics. Those working at the governmental level above municipalities primarily serve in an advisory capacity, helping

[121] AAM Program Manager, Interview #2.

communities adopt new technologies and fostering connections between manufacturers and other entities. They view these technologies as tools that can elevate certain states or regions to leadership positions. Crucially, it's important to note that, as Interviewee #2 stated, their state has limited authority over local land use decisions, making their role centered on providing guidance and promoting responsible and safe adoption of technology. When speaking with individuals working at a municipality level, such as Interviewee #5, it seemed like they wanted to be far more involved but were limited in their direct impact. Overall, it seemed like the complex relationships between private companies, the U.S. Federal Government, state governments, regional associations, quasi-governmental organizations, and the city governments themselves paint a complicated picture of incentives.

Chapter 5: Conclusion

Throughout this study, I have sought to understand how municipalities use historic lessons when considering new transportation technologies. The impact of automobiles, specifically those of Robert Moses on New York City have endured decades, changed countless lives, and had an gigantic impact on how society works on a regular basis, often in conflict with the basic attributes that the majority of folks that study urban planning from archeologists like Childe, activists like Jacobs, and social theorists like Mumford all seem to believe are critical. Whether these specific historical lessons are inherently understood by modern day individuals involved in decision-making around eVTOLs is unknown, but based on my research, it does not seem to be that those lessons are taken into account, certainly not explicitly and likely not implicitly on a large scale. There are few (no?) Jane Jacobs in the world told protesting against the development of vertiports. For nearly the entire public, eVTOLs are the flying cars that they sometimes hear will be shown off at an upcoming Olympics. As we place importance on the needs of monotechnic users, we place the risk on the structure of the things (in this case, urban communities) we are trying to protect. The lessons and approaches that Jacobs identified in her published works and protest activities, the ones that addressed the faults of massive automobile infrastructure and proliferation in urban areas, those aspects are significantly lacking in today's discussion of eVTOLs.

So how do cities draw on the history of introducing new technology when considering new transportation methods, such as eVTOLs? The answer, based on the research conducted here, is that they do not. The spirit of technological determinism reigns supreme and the push to innovate and find applications later appears to be the default. Technological innovations have rained prosperity on civilizations throughout history and this research does not lead to a Luddite-like conclusion. This research focused on is addressing the question of whether cities have considered errors in the past such as the automobile's impact on fracturing urban structures while making current decisions around how and when to successfully implement technological solutions, particularly in transportation.

This study took many different paths, exploring some underlying principles of urban planning and technological determinism, the development and proliferation of the American automobile industry, it's marketing approach, and how those influences proliferated into urban planning. All research seemed to draw the conclusion that, just as in the past, industry seems to be paving the way and pushing solutions that government entities are encouraged to embrace. The solutions are technologically deterministic, pushing the idea that technology will create a better, more efficient lifestyle for the citizens involved. Progress comes along with technology, and the focus should be on ensuring that the technology is safe and efficient rather than addressing if it solves a problem (or if the problem actually exists). If our problem is that transit takes too long, why is the solution flying vehicles rather than faster trains? Why is the solution not more available jobs closer to where people live?

Nothing in this thesis is meant to be a rejection of technology or positive technological determinism. This study is meant to advocate that municipalities take care when making decisions around incorporating new technologies, especially those as permanent, expensive, and life-altering as transportation technology. Governments are intended to provide the best collective resources and decision-making for its citizens and in that spirit, should embrace technology when it is more efficient and a net positive for society. As stated, eVTOLs incorporate a diverse set of technologies within them that governments can and should harness to address a variety of problems. However, it is up to those governments to determine the problems they face, their priority, and search out solutions, rather than have those solutions marketed and sold to them.

The City of Los Angeles is at the forefront of addressing the types of concerns discussed in this thesis. Their "Aerial Mobility Report" starts with a section titled "Creating a Preferred Future". This section, although focused on aviation specifically notes,

> Yesterday's decisions have unevenly distributed negative impacts from airport and heliport development and operations. Such impacts could have been mitigated had more interdisciplinary policy making been a paramount consideration.[122]

This report is the single representation that I could find that indicates a municipality is actively acknowledging lessons from the past and attempting to ensure that they are not repeated in the future. The report highlights aspects discussed in this thesis such as the proper role of the City of Los Angeles in decision-making, as opposed to the FAA and other groups. It discusses equity, land use, and consideration on how to properly integrate into other transportation systems. It's not lost that few cities in the United States are more defined by highways and car culture than Los Angeles and perhaps that hard lesson has been part of the reason why this is the most extensive report I could find related to these topics. I strongly support this approach and suspect that with a continued move in this direction, Los Angeles will find itself in the right spot when it comes to successfully incorporating eVTOLs while preserving important aspects of good urban planning. There is still much development to be done, in regard to vehicle development, CONOPs development, and how to successfully apply this technology. It's important for municipalities to be knowledgeable and involved in this process. For these reasons, I support the following recommendations that Clint Harper (also an author of the LA study) provided to Congress to regard to the FAA Reauthorization Bill[123]:

- Seek to balance who is burdened by aviation with who benefits while prioritizing equity in all AAM ecosystem areas and multimodal development.

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[122] Reynolds, Porras, and Janna, "Aerial Mobility Report."

[123] *FAA Reauthorization: Harnessing the Evolution of Flight to Deliver for the American People.* 118th Cong. (2023) (statement of Clint Harper)

- The FAA Reauthorization Bill should incentivize cities to dedicate resources to exploring and engaging with AAM-specific issues related to challenges within local transportation systems, and the further development of digital infrastructure tools.
- The FAA Reauthorization Bill should fund educational programs and resources to increase the awareness of aviation professionals on how aviation fits into larger transportation systems and how residents perceive aviation's negative externalities and benefits.
- The FAA Reauthorization Bill should include measures that help cities better regulate and manage urban aviation systems that include private facilities, through inspections, active risk mitigation, and communication.
- The FAA Reauthorization Bill should include measures to encourage diversity in the aviation workforce, provide training and education programs for transitioning veterans, and incentivize private companies and organizations to assist with the recruitment of new personnel.

In addition, I recommend that steps are taken to reverse the roles between private industry and governmental bodies regarding identifying and prioritizing issues, and to recognize that technology is incredible and responsible for much of history's progress, but applied haphazardly, has enormous risks that are realized in costly rework and even lives when considering pollution and strain on society, to say nothing of how it impacts the core attributes of humanity's greatest invention, the city. As noted several times, only the City of Los Angeles currently has a well-developed policy around AAM that takes externalities into consideration. Why haven't other target cities followed suit with a similar set of guidelines? I speculate this is for several reasons that are alluded to throughout this research. First, the United States is built on a strong sense of technological determinism. "Where is my flying car?" is a common phrase when talking about stagnation of society. Our history lessons are geared toward

identifying technological developments as moments of progress and change such as the printing press and The Reformation. Many municipalities embrace this sense of progress and want to be seen as futurist, which is certainly better than being seen as outdated. Another reason for this lack of focus on eVTOLs is, as Interview #5 has stated, there are already too many things that municipalities focus on. Assessing each potential upcoming technology can be a fool's errand, especially one as perennially imminent as the idea of a flying taxi. Lastly and in tandem with the previous explanation, municipalities often defer to other entities to do this legwork. In those cases, often those entities have different incentives such as quasi-governmental organizations which may have a mandate for development or in the case of private businesses, have an incentive to sell products. This dynamic often puts the municipality in a more dire reactionary mode, which is reasonable when it involves infrastructure for something with minimal impact like micromobility but catastrophic if the technology is more monotechnic such as the automobile.

A formal framework for assessing new technologies against these attributes should be developed and assessed, using examples of the past, such as regrettable infrastructure that has been corrected (for example, I-93 in Boston) and celebrated infrastructure that was undoubtedly a success (such as Moses' own Triborough Bridge). Using the guidelines provided by Moroni and Chiffi (discussed on page 39), municipalities could develop both the parameters where private entities could develop products as well as create an opportunity for assessing any new technologies. Moroni and Chiffi described two main prescriptions to follow, an evolutionary approach to introducing new technologies and creating negative rules. These two aspects could be expanded to create an assessment of new technologies. Such an assessment could ask which attributes are important to a community (reflecting the negative regulations aspect, e.g. what a community wishes to protect), attributes about the new technology, and an expected thought through plan of the technology's rollout with various Key Performance Indicators to measure. This recommendation, to build an assessment tool, is to be used in conjunction with the recommendations above mentioned in Clint Harper's testimony before Congress and my additional commentary on that

topic. An assessment tool such as this would provide a constant reminder of the values of a community when being presented with new technology, transportation or otherwise.

As stated, this thesis took many turns, but I felt it was important to explore tangential areas such as technological determinism and the arguments that Jacobs used in her battles against the infrastructure proposed by Robert Moses. That said, there were still many topics that I wish I had the space to explore further and would encourage others to do so in further research. First, this thesis was focused on the adoption of new transportation technologies in the United States. I feel there is much to be said when comparing and contrasting the approach taken in the United States to that done by other cultures, in other countries. For example, analyzing how the United States approaches new technologies with either a communist country like China, or a European country where more standard "urbanist" values are celebrated would be fascinating. In addition, I found the development and history of quasi-government organizations like the NYCEDU to be fascinating. The impact of Triborough during Robert Moses' years is at the center of many studies, and I think an analysis of its descendants such as the NYCEDU and their impact on New York (or lack thereof, as to be determined) would bring a great deal of information to this larger topic of who makes decisions for a municipality and why.

I'm hopeful for the promises of technological development and am myself an optimist when it comes to technological determinism. I see the progress of history as one developing new technology, adapting to them, and finding ourselves in a better situation before. Unfortunately, the period of adaptation is often unnecessarily difficult because of hastily made decisions and a desire to be seen as at the forefront of progress, at the expense of the current well-being of its citizens. Prudent understanding of the past and an obsession with learning the lessons of those historic incidents is paramount to actual societal progress and well-being.

Appendices

Appendix A – Interview Questions

The following is a list of questions that I have asked each of the interviewees. Beyond this, it is an open-ended conversation based on the answers to these questions. I will refrain from asking questions soliciting an opinion which would require a full Protocol via the IRB process.

- Please provide information about your general relationship with the eVTOL or vertiport industry including the type of organization that you work with and its size. Please do not disclose your name, your organization, or any other identifiable details.
- What types of problems are communities facing when they begin assessing new forms of transportation methods?
- How do communities find solutions to these problems? Do you think community officials search out solutions or are the solutions presented to them?
- What role does the public play in the decision-making and evaluation process?
- How much autonomy do government officials have in making independent assessments of new technologies?
- What does your organization see as important to preserve within an urban community? Examples could be density, neighborhood cohesion, limited externalities (noise, pollution, etc.)
- Please describe how your organization envisions eVTOL usage within an urban area.
- Have you seen The City of Los Angeles' Aerial Mobility Report?
- Are you aware of other cities that have similar reports or guidelines for eVTOL operations?
- What future plans does your organization have in order to ensure that eVTOL implementation benefits the communities in which they develop?

Appendix B – Table Summary of Interviews

	Interviewee #1	**Interviewee #2**	**Interviewee #3**	**Interviewee #4**	**Interviewee #5**	**Interviewee #6**
Description of Interviewee	Business Development Manager at Vertiport Developer	State DOT Program Manager focused on AAM	Policy Analyst for Elected City Council Member	Aviation Planner for Regional Association	Urban Planner Employed by a Large City	Director of Intermodal Transportation at a State DOT
Referenced Leveraging Technology	Yes, focused on applying eVTOL technology to a wide range of applications. Specifically notes that the "urban taxi" model may not work for their area.	Yes, but appeared to defer to technological development to private companies. Very interested in other applications for technologies outside of "urban taxis".		Extremely focused on ensuring that the represented region is seen as a technical leader in this area	Yes, but only as a solution to problems already identified (rather than being presented with a product and being tasked with finding the application)	Yes, noted the core technological aspects that could be harnessed
Referenced Political Difficulties			Noted political difficulties in working with quasi-government organizations			
Referenced Focus on Bringing Groups Together		Yes, very focused on ensuring that localities, state governments, federal bodies (FAA) are interacting		Yes, very focused on ensuring localities, state governments, federal bodies, private companies, and universities are interacting		Yes, very focused on ensuring localities, state governments, federal bodies, and private companies are interacting

Appendix C – New Transportation Technology Assessment

1) **Which aspects are considered positive for our community and are they sustainable in the long term? If possible, reference a municipal plan.** (*This harkens back to the negative rules principle introduced by Moroni and Chiffi. Examples could be population density, low pollution, safety, mixed-use neighborhoods, diversity, a particular industry, strong-governmental involvement, strong-business involvement, strong sense of community, resident housing stability, population stability, public transportation, or walkability.)*

2) **Guiding Urban Principles - Population density and stability are key components to a city's adaptivity and survival. How does this new technology impact those aspects?** *(this concept ensures that residents of communities remain in control and their town core remains strong)*

3) **What problem(s) are we trying to solve with this new technology?**

4) **Do we have existing technology that aligns better with our values outlined in questions #1 and #2 that can perform this role but has other hurdles? Why is this technology a better option than addressing the current hurdles?**

5) **Who benefits the most from this technology's adoption? Is it weighted heavily toward a particular demographic? Who does it benefit the least?** *(this ensures that the entire community is considered)*

6) **Who will be impacted by this new technology? List all stakeholders and how they are represented.**

7) **What externalities are to be expected? What risks have been identified involving safety, cost, and regulatory impact** *(this should never be "none". All changes have externalities, and this will highlight aspects missed in question #1)*

8) **In which ways will our community need to adapt to this new technology?** *(this question is asking if the technology is monotechnic).*

9) **How will the new technology be implemented? Timeline? At which point will there be an opportunity to assess its impact on the community? What Key Performance Indicators will be used to assess the technology?** *(this question is targeted at Moroni and Chiffi's principle of evolution. The goal is to start slow and see how the technology evolves and adapts. The community's priority is the welfare of its citizens, not the progress of technology).*

10) **How possible would it be to roll back technology if the impact is determined to be negative? What would be the cost?**

11) **To what historic transportation technology introductions is this similar? Why is it similar and how does it differ?**

Bibliography

AAM Program Manager. Interview #2, January 17, 2025.

Antcliff, Kevin, Nicholas Borer, Sky Sartorius, Pasha Saleh, Robert Rose, and Maxime Gariel. “Regional Air Mobility.” NASA, April 2021. https://sacd.larc.nasa.gov/wp-content/uploads/sites/167/2021/04/2021-04-20-RAM.pdf.

Aviation Planning Manager. Interview #4, January 29, 2025.

Ballon, Hilary, and Kenneth T. Jackson. *Robert Moses and The Modern City: The Transformation of New York*. New York: W.W. Norton, 2007.

BD Manager. Interview #1, October 23, 2024.

Bernier, Nathan. “Funding Freeze for I-35 Expansion Denied in Heated CAMPO Vote.” Austin Monitor, May 14, 2024. https://www.austinmonitor.com/stories/2024/05/funding-freeze-for-i-35-expansion-denied-in-heated-campo-vote/.

BisAviation. “The Capital of São Paulo Has the Largest Fleet of Helicopters in the World.” *BisAviation Group* (blog), May 9, 2022. https://bisaviation.com.br/the-capital-of-sao-paulo-has-the-largest-fleet-of-helicopters-in-the-world/.

Caro, Robert A. *The Power Broker: Robert Moses and the Fall of New York*. 1st ed. New York: Vintage Books, 1975.

Celli, Mattia, Jan Schmidt, and Jim Harris. “Advanced Air Mobility: What Electric Air Taxis Need to Take Off.” Bain and Company, July 2024. https://www.bain.com/insights/advanced-air-mobility-what-electric-air-taxis-need-to-take-off/.

Childe, Gordon V. “The Urban Revolution.” In *The City Reader*, by Richard T. LeGates and Frederic Stout, 2nd ed. New York: Routledge, 2000.

Director of Multimodal Transport. Interview #6, February 10, 2025.

“Electrified Powertrain Flight Demonstration (EPFD) Project.” Accessed February 3, 2025. https://www.nasa.gov/directorates/armd/iasp/epfd/.

Engels, Frederick. *Condition of the Working Class in England*. Translated by Florence Kelly Wischenewetzky. London: George Allen and Unwin Ltd., 1892.

Eve Air Mobility. “A Collaboration Led by Eve Publishes Concept of Operations for Urban Air Mobility in Rio de Janeiro,” May 4, 2022. https://www.eveairmobility.com/a-collaboration-led-by-eve-publishes-concept-of-operations-for-urban-air-mobility-in-rio-de-janeiro/.

“FAA Reauthorization: Harnessing the Evolution of Flight to Deliver for the American People.” 2167 Rayburn House Office Building, March 30, 2023. https://transportation.house.gov/calendar/eventsingle.aspx?EventID=406240.

Feuer, Alan. “Hell on Wheels, and Nerves; If Ever There Was a Mean Street, It’s the Cross Bronx.” *The New York Times*, September 20, 2002, sec. New York.

https://www.nytimes.com/2002/09/20/nyregion/hell-on-wheels-and-nerves-if-ever-there-was-a-mean-street-it-s-the-cross-bronx.html.

Finnegan, William. “The Politics That Derailed Congestion Pricing in New York.” *The New Yorker*, June 24, 2024. https://www.newyorker.com/news/daily-comment/the-politics-that-derailed-congestion-pricing-in-new-york.

Flint, Anthony. *Wrestling with Moses: How Jane Jacobs Took on New York’s Master Builder and Transformed the American City*. New York: Random House, 2011.

Ford Corporate. “The Moving Assembly Line.” Accessed January 18, 2025. https://corporate.ford.com/articles/history/moving-assembly-line.html.

Gast, John. *American Progress*. 1872. Oil on Canvas, 29.2 cm x 10 cm. 92.126.1. Autry Museum of the American West.

Geddes, Norman Bel. *Magic Motorways*. 1st ed. New York: Random House, 1940.

General Electric. “These Cars Can Run on Any Fuel. Gas. Or Water. Or Even Garbage.” *Metro Newsletter*, Quarter 1975, Vol. 2, No. 5 edition. https://www.google.com/books/edition/Metro_Newsletter/hwA6AQAAMAAJ?hl=en&gbpv=1&dq=%22these%20cars%20can%20run%20on%20any%20fuel.%20gas%20or%20water.%20or%20even%20garbage%22&pg=PA2&printsec=frontcover.

Goldin, Greg, Sam Lubell, and Daniel Libeskind. *Never Built New York*. New York, NY: Metropolis Books, 2016.

Grabar, Henry. *Paved Paradise: How Parking Explains the World*. New York: Penguin Press, 2023.

Group, Mercedes-Benz. “Benz Patent Motor Car: The First Automobile (1885–1886).” Mercedes-Benz Group. Accessed January 18, 2025. https://group.mercedes-benz.com/company/tradition/company-history/1885-1886.html.

“Home | Electra.Aero.” Accessed February 3, 2025. https://www.electra.aero/.

Jacobs, Jane. *The Death and Life of Great American Cities*. Anniversary Edition. New York: Modern Library, 2011.

Joby. “Joby Flies Quiet Electric Air Taxi in New York City,” November 13, 2023. https://www.jobyaviation.com/news/joby-flies-quiet-electric-air-taxi-new-york-city/.

“Joby Aviation | Joby.” Accessed February 3, 2025. https://www.jobyaviation.com/.

“Joby Hits Range, Noise Targets On Road To Certification | Aviation Week Network.” Accessed February 3, 2025. https://aviationweek.com/aerospace/advanced-air-mobility/joby-hits-range-noise-targets-road-certification.

King, Noel. “A Brief History Of How Racism Shaped Interstate Highways.” *NPR*, April 7, 2021, sec. History. https://www.npr.org/2021/04/07/984784455/a-brief-history-of-how-racism-shaped-interstate-highways.

Larson, Christina. “Archaeologists Find Evidence That Horseback Riding Began at Least 5,000 Years Ago.” PBS News, March 3, 2023. https://www.pbs.org/newshour/science/archaeologists-find-evidence-that-horseback-riding-began-at-least-5000-years-ago.

Le Corbusier. *The City of To-Morrow and Its Planning*. Translated by Frederick Etchells. 3d ed. New York: Dover Publications, 1987.

LeMoult, Craig. “Car Pollution In Boston Area Neighborhoods Poses Health Risk To Residents, New Research Finds.” GBH, September 22, 2019. https://www.wgbh.org/news/local/2019-09-22/car-pollution-in-boston-area-neighborhoods-poses-health-risk-to-residents-new-research-finds.

Lewis, Mumford. *The Pentagon of Power*. Vol. 2. 2 vols. The Myth of the Machine. New York: Harcourt, Brace, & World Inc, 1964.

“Local Governments in the U.S.: A Breakdown by Number and Type.” Accessed March 3, 2025. https://www.stlouisfed.org/publications/regional-economist/2024/march/local-governments-us-number-type

Manuscripts and Archives Division, The New York Public Library. “General Motors - Futurama - Norman Bel Geddes with Man Looking at Model.” New York Public Library Digital Collections. Accessed April 26, 2025. https://digitalcollections.nypl.org/items/5e66b3e8-cc45-d471-e040-e00a180654d7.

MarketsandMarkets. “eVTOL Aircraft Market Size, Share, Industry Report, Revenue Trends and Growth Drivers.” Accessed January 6, 2025. https://www.marketsandmarkets.com/Market-Reports/evtol-aircraft-market-28054110.html.

McFadden, Robert D. “5 Killed as Gopter on Pan Am Building: Throws Rotor Blade.” *The New York Times*, May 17, 1977, Late City Edition edition, sec. Front Page. https://www.nytimes.com/1977/05/17/archives/5-killed-as-copter-on-pan-am-building-throws-rotor-blade-one-victim.html.

McKinsey. “A Year of Electric Vehicle and Mobility Trends.” Accessed January 6, 2025. https://www.mckinsey.com/industries/automotive-and-assembly/our-insights/spotlight-on-mobility-trends.

Mitchell, Brian Redman. *International Historical Statistics: The Americas 1750-1988*. 2nd ed. New York: Stockton Press, 1993.

Moroni, Stefano, and Daniele Chiffi. “Uncertainty and Planning: Cities, Technologies and Public Decision-Making.” *Perspectives on Science* 30, no. 2 (April 2, 2022): 237–59. https://doi.org/10.1162/posc_a_00413.

Moss, Brian. “Levittown and The Suburban Dream of Postwar New York.” *New York Daily News* (blog), August 14, 2017. https://www.nydailynews.com/2017/08/14/levittown-and-the-suburban-dream-of-postwar-new-york/.

Mumford, Lewis. *The City In History: Its Origins, Its Transformations, and Its Prospects*. New York: Harcourt, Brace, & World Inc, 1961.

———. “What Is a City.” *Architectural Record* 82.5 (1937): 59–62.

"National Plan of Integrated Airport Systems (NPIAS) - Current | Federal Aviation Administration." Accessed February 3, 2025. https://www.faa.gov/airports/planning_capacity/npias/current.

"Neighborhood – Brooklyn Heights Association." Accessed February 16, 2025. https://thebha.org/neighborhood/.

Nielsen, John. "Cul-de-Sacs: Suburban Dream or Dead End?" *NPR*, June 7, 2006, sec. Environment. https://www.npr.org/2006/06/07/5455743/cul-de-sacs-suburban-dream-or-dead-end.

Norton, Peter. *Autonorama: The Illusory Promise of High-Tech Driving*. Washington, DC: Island Press, 2021.

Peters, Peter Frank. *Time, Innovation and Mobilities: Travel in Technological Cultures*. International Library of Sociology. New York: Routledge, 2006.

Policy Analyst for Councilmember. Interview #3, January 27, 2025.

Powers, Alan. "Book: Blast on the Past." *The Architectural Review* (blog), February 15, 2019. https://www.architectural-review.com/essays/books/book-blast-on-the-past.

Proust, Marcel. *In Search of Lost Time*. Edited by William C. Carter. Translated by Charles Kenneth Scott-Moncrieff. Vol. 4. New Haven: Yale University Press, 2021.

Reynolds, Seleta, Marcel Porras, and Smith Janna. "Aerial Mobility Report." LADOT. Accessed January 7, 2025. https://ladot.lacity.gov/aerialmobilityreport.

Reynolds, Seleta, Marcel Porras, and Janna Smith. "Urban Air Mobility: Policy Framework Considerations." LADOT, September 13, 2021. https://ladot.lacity.gov/aerialmobilityreport.

Smith, Merritt Roe, and Leo Marx, eds. *Does Technology Drive History? The Dilemma of Technological Determinism*. Cambridge, Mass.: MIT Press, 2001.

Statista. "United States: Motor Vehicles in Use 1900-1988." Accessed January 18, 2025. https://www.statista.com/statistics/1246890/vehicles-use-united-states-historical/.

Strong Towns. "America's Growth Ponzi Scheme," September 1, 2015. https://www.strongtowns.org/journal/2020/5/14/americas-growth-ponzi-scheme-md2020.

"Technology | Electra.Aero." Accessed February 3, 2025. https://www.electra.aero/technology.

The Boring Company. "Tunnels." Accessed January 6, 2025. https://www.boringcompany.com/tunnels.

The Skyscraper Museum. "Housing Density: From Tenements to Towers." Accessed January 6, 2025. https://skyscraper.org/housing-density/history/.

Unwin, Raymond. *Nothing Gained From Overcrowding!* 3rd ed. Westminister: P.S. King & Son, 1912.

Vinckeboons, Joan. "Manatvs Gelegen Op de Noot Sic Riuier." Image. Library of Congress, Washington, D.C. 20540 USA, 1670. https://www.loc.gov/resource/g3804n.ct000050/.

Waldek, Stefanie. “60 Years Ago, The Modernist City of Brasília Was Built From Scratch.” Architectural Digest, August 21, 2020. https://www.architecturaldigest.com/story/60-years-ago-modernist-city-brasilia-built.

West Coast Urban Planner. Interview #5, January 30, 2025.

“Why Hydrogen Makes Sense for Aviation | Joby.” Accessed February 3, 2025. https://www.jobyaviation.com/blog/why-hydrogen-makes-sense-for-aviation/.

Williams, Germaine, and Tom Howard. “Highway Finance: Past, Present, and Future.” *Public Roads*, Summer 1994. https://highways.dot.gov/public-roads/summer-1994/highway-finance-past-present-and-future.

Wisk. “Autonomy.” Accessed February 3, 2025. https://wisk.aero/autonomy/.

Wisk. “Wisk and the City of Sugar Land, Texas, Partner to Bring Autonomous Air Taxis to the Greater Houston Region,” January 21, 2024. https://wisk.aero/news/press-release/wisk-sugar-land/.

Yin, Robert K. *Case Study Research: Design and Methods*. 2nd ed. Vol. 5. Applied Social Research Methods. Thousand Oaks: Sage, 2001.