Virginia Aviation Parts and Supplies Tax Exemption Survey Report

January 2025

Prepared by:

Virginia Aviation Business Association (VABA)
The Voice of Business Aviation in Virginia

Submitted to:

Virginia General Assembly Aviation and Aerospace Caucus

Executive Summary:

This report evaluates the economic impact and outcomes of the Virginia Aviation Parts, Engines, and Supplies Tax Exemption, passed in 2017, enacted July 1, 2018, and reenacted with modifications in 2021. The report examines survey data from industry stakeholders, outlines economic benefits, and provides recommendations for the program's future.

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Summary

1. Background

- Virginia's aviation industry supports 147,000 jobs and generates $23 billion in economic activity annually, according to the most recent data published by the Virginia Department of Aviation (DOAV). However, given the significant increase in aviation demand since 2021, it is highly probable that the economic impact has increased.[1]
- The 2017 Aviation Parts, Engines, and Supplies Tax Exemption aimed to boost Virginia's competitiveness in aircraft maintenance by exempting sales taxes for general aviation aircraft parts and supplies. A 2021 reenactment restricted the exemption to aircraft with a gross takeoff weight over 2,400 pounds and added a sunset provision for June 30, 2025.
- Neighboring states like Maryland and North Carolina have permanent or competitive aviation tax policies, influencing regional dynamics.[2]

2. Economic Impact

- The VABA conducted a 2024 survey in partnership with the Aircraft Owners and Pilots Association (AOPA) and National Business Aviation Association (NBAA). The survey revealed $25 million in reported spending on maintenance and repairs in Virginia between 2018 and 2024, but this figure underrepresents the true economic impact of the exemption due to the exclusion of larger operators in the study
    - Using industry benchmarks, the total estimated five-year maintenance spending for 6,044[3] general aviation aircraft based in Virginia is $278 million or greater.
    - 58% of aircraft owners said the tax exemption influenced their decision to use Virginia-based maintenance facilities.
    - 82% of maintenance facilities reported increased business since 2018.
- Despite Covid, survey respondent report an average annual growth of 9.35% since the implementation of the tax exemption.

The tax exemption supports traditional aviation maintenance and repair while strengthening Virginia's role as a leader in emerging aviation technologies, such as drones, advanced air mobility, and unmanned systems. By reducing operational costs for these innovative sectors, the exemption fosters technological growth and attracts new businesses to the Commonwealth.

3. Survey Results

Aircraft Maintenance Business Owners:

- 81% saw business growth; 63% added services like avionics and modernizations.
- 63% attracted out-of-state work, primarily from North Carolina, Maryland, Florida, and Georgia.

Flight Schools:

- 100% rely on the tax exemption for cost efficiency.

[1] https://doav.virginia.gov/wp-content/uploads/Files/DocumentLibrary/Virginia%20Airport%20Economic%20Impact%20Study%202018.pdf. Note, DOAV is in the process of reconducting this survey
[2] https://nbaa.org/flight-department-administration/tax-issues/state-taxes/
[3] Total number of registered aircraft in Virginia according to FAA registration database as of January 13, 2025 https://registry.faa.gov/aircraftinquiry/Search/StateCountyInquiry

- Virginia's 60 flight schools, operating hundreds of aircraft, face significant maintenance costs.

Aircraft Operators/Owners:

- 80% indicated the exemption influenced their decision to conduct maintenance in Virginia.
- Without the exemption, many would shift work to other states with favorable tax policies.

Aircraft Maintenance Technicians:

- 67% noted increased workload since 2018, with expansion plans tied to the exemption's continuation.

4. Analysis

- Virginia's strategic location, existing aerospace industry, and infrastructure create a unique competitive advantage for the Commonwealth.
- The aviation industry is highly mobile, with operators prioritizing cost savings. The exemption is vital to retaining businesses and attracting out-of-state work.
- Excluding aircraft with a gross-takeoff weight (GTW) less than or equal to 2,400[4] pounds from the exemption disproportionately affects smaller aircraft owners, flight schools, and operators, driving business to neighboring states.

5. Recommendations

a. Permanently Extend the Tax Exemption:

- Key to supporting the aviation repair economy.
- Allows Virginia to remain competitive and attract out-of-state maintenance business.

b. Expand the Exemption to Aircraft with a GTW less than or equal to 2,400 pounds:

- Incentivizes maintenance work for smaller aircraft and benefits flight schools, which play a critical role in workforce development.

Key Insights

- **Workforce Shortages:** The industry faces critical shortages in pilots and technicians, underscoring the need for competitive policies to attract talent and retain businesses.
- **Economic Growth:** The exemption has supported business expansion, job creation, and infrastructure investment in Virginia.
- **Threat of Expiration:** The 2025 sunset provision risks pushing maintenance work and associated economic activity to other states.

Virginia must act to secure a permanent and expanded tax exemption to sustain its aviation industry, ensure competitiveness, and capitalize on long-term growth opportunities in aerospace and advanced air mobility.

[4] Gross takeoff weight includes plane, fuel, cargo, and passengers

1. Background

In 2016, Virginia's network of 65 public-use airports and aviation-related services supported approximately 147,000 jobs and generated nearly $23 billion in economic activity, serving the air travel needs of residents, businesses, and visitors.[5]

Recognizing the economic potential of non-commercial aviation, including flight schools, training centers, agricultural aviation, and private industry, Virginia legislators enacted the Virginia Aviation Parts, Engines, and Supplies Tax Exemption in 2017. This legislation temporarily exempted owners of what is classed as general aviation aircraft from paying sales taxes on parts purchased for repair and maintenance, aiming to improve Virginia's competitiveness in aviation maintenance and repair compared to neighboring states. During the 2021 session of the Virginia General Assembly, the legislature reenacted the tax exemption to exempt only aircraft with a gross take off weight greater than 2,400 pounds and included a sunset provision for June 30, 2025.[i]

Understanding the geographical context of Virginia's aviation industry is critical. States with permanent tax exemptions for aircraft repairs and parts are only a short two-hour trip away, offering significant potential savings for aircraft owners—potentially tens of thousands of dollars per repair or more (Figure 1).[6] According to a 2021 Trade and Transportation Incentives (JLARC) report, stakeholders indicated in 2018 that the exemption spurred growth in Virginia's airport repair industry.[7]

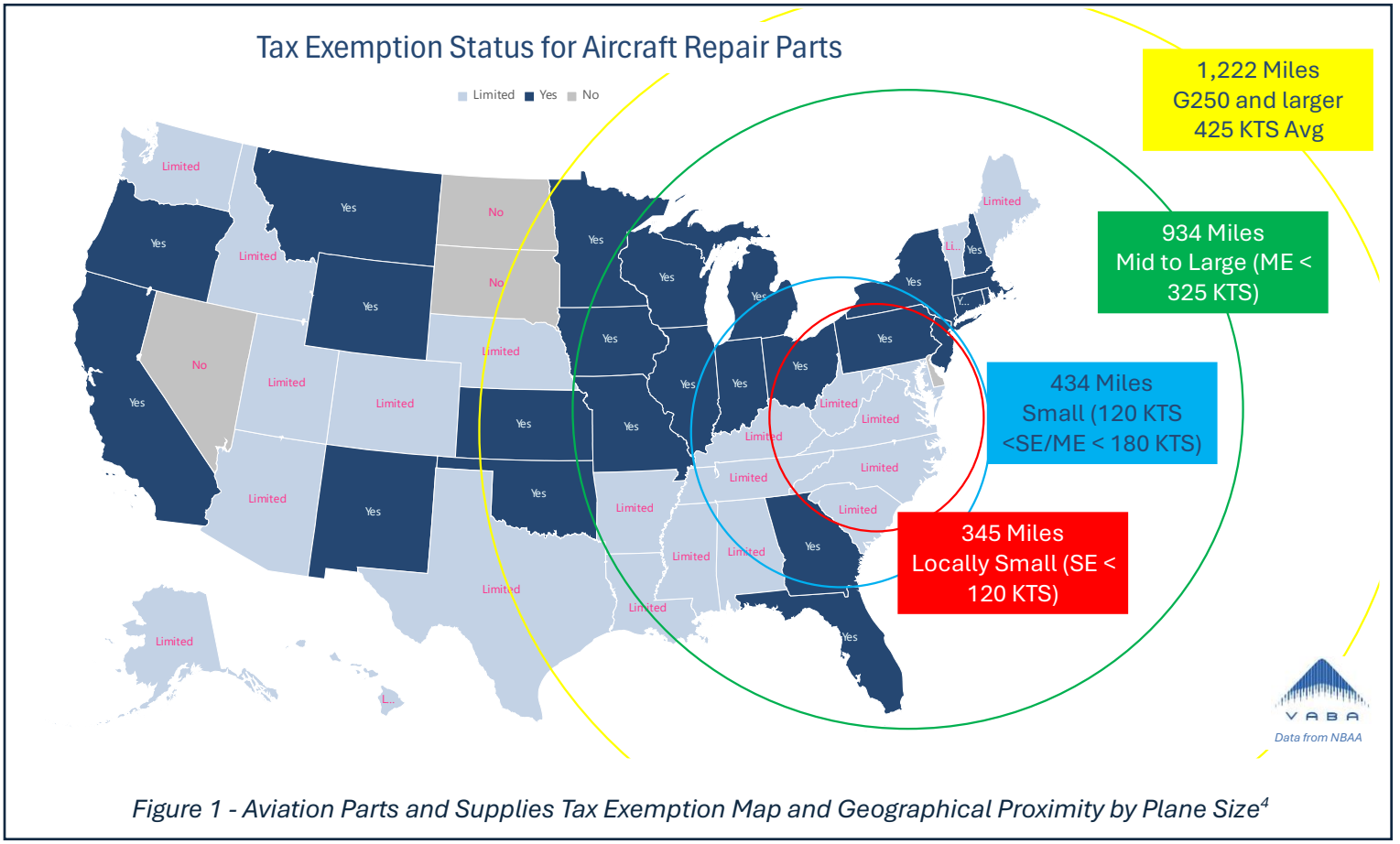

Figure 1 - Aviation Parts and Supplies Tax Exemption Map and Geographical Proximity by Plane Size[4]

According to the National Business Aviation Association (NBAA), approximately 36 states offer some form of tax exemption or credit for aviation parts and supplies. These incentives are designed to make their aviation industries

[5] https://doav.virginia.gov/wp-content/uploads/Files/DocumentLibrary/Virginia%20Airport%20Economic%20Impact%20Study%202018.pdf
[6] https://nbaa.org/flight-department-administration/tax-issues/state-taxes/
[7] https://jlarc.virginia.gov/pdfs/reports/Rpt550-1.pdf

more competitive and attract business from both in-state and out-of-state aircraft owners and operators. neighboring states such as Maryland, West Virginia, Kentucky, Tennessee, and North Carolina provide similar tax benefits, contributing to a competitive regional environment. States with significant aviation maintenance industries, including Wisconsin, Georgia, Maine, Massachusetts, Texas, and Florida, also offer tax incentives to support their aviation sectors. Wisconsin, Georgia, Maine, Massachusetts, Texas, Florida, South Carolina, and Ohio have proven very capable of attracting and expanding their aviation and aerospace footprint with investments in research and development as well as investments in manufacturing and assembly. [4]

The unwritten policy of the Virginia General Assembly has been to include a sunset provision on most tax credits or exemptions to allow for periodic review of how the credit or exemption is benefiting the Commonwealth. The aviation parts and supplies tax exemption is set to expire on July 1, 2025.[8]

According to the latest data from the NBAA, none of Virginia's neighboring states currently offer a permanent tax exemption for aircraft repairs and parts (Figure 1). This varied and complex tax landscape creates confusion and significant challenges for aircraft owners and operators, maintenance facilities, and aircraft maintenance technicians (AMTs) as they navigate these regulations. Virginia's tax exemption is simple and easy to administer and understand for maintenance facilities allowing them to more effectively compete against other states allowing for its benefit to be a part of the customer's quote for work.

The VABA conducted a 2024 survey in partnership with the Aircraft Owners and Pilots Association (AOPA) and National Business Aviation Association (NBAA). The survey evaluated the economic impact of Virginia's temporary tax exemption. [9] Between 2018 and 2024, respondents, Virginia aircraft owners and operators reported spending $25 million on maintenance and repairs at aviation facilities within the Commonwealth (see Figure 2 for a detailed breakdown).

Among the aircraft owners surveyed, 58% indicated the tax exemption influenced their decision to have maintenance work performed in Virginia. This shift toward in-state services is further supported by feedback from aircraft maintenance facilities and technicians, with 82% of maintenance facilities surveyed reporting an increase in business since the exemption went into effect in 2018.

The 2024 survey evaluated the economic impact of Virginia's tax exemption. Between 2018 and 2024, both Aircraft Maintenance Business Owners and Aircraft Owners and operators reported spending $25 million on maintenance and repairs at aviation facilities within the Commonwealth (see Figure 2 for a detailed breakdown).

Figure 2 - Economic Impact of Exemption on Repair and Rework

There were many larger maintenance and repair businesses as well as aircraft operators that did not participate in the survey making it difficult to obtain a realistic number on actual spending in the Commonwealth. However, those that were apprehensive to complete the survey, sat down for one-on-one interviews for the report. Their hesitancy to participate in the formal report surrounded their private ownership status and confidentiality of internal financial information As a result, the $25 million in reported revenue over five years doesn't fully capture the true annualized economic impact of the parts and supplies tax exemption.

As such, the projections presented in this report are intentionally conservative and do not fully capture the economic impact of the aviation parts and supplies tax exemption. For instance, reported data does not include significant contributions from out-of-state aircraft serviced in Virginia or non-Virginia-based aircraft utilized by

[8] https://www.tax.virginia.gov/sales-tax-exemptions
[9] Full list of questions can be found in Appendix A

proportional share ownership companies and air charters that now conduct maintenance in the Commonwealth. Consequently, the true annual economic impact is likely much greater than the figures provided.

Large operators, like fractional ownership and charter companies, also perform extensive maintenance in Virginia. Again, because of the competitive nature of the business, their contributions were not included in the study's total financial report.

The Virginia Department of Aviation (DOAV) has identified 60 flight schools in Virginia, ranging from small businesses to large operations with significant fleets. These schools own or lease back hundreds of aircraft and spend large amounts on required maintenance to meet Federal Aviation (FAA) regulations. For instance, one Virginia flight school with over 50 aircraft spends millions annually on maintenance. Considering similar spending based on an average per aircraft annual spend across all 60 flight schools, the total maintenance costs likely far exceed the conservative estimates in this study.

To identify a more realistic number for annual spend on aircraft maintenance and repair, the report turns to the Aircraft Owners and Pilots Association (AOPA) to make certain assumptions. The estimation provided bases its result only on maintenance performed on the 6,044 aircraft based and registered in Virginia per the DOAV. These calculations conservatively estimate the annual maintenance spend on general aviation aircraft in Virginia to be $55,604,800 per year or $278,024,000 over the five-year period 2018 through 2023.

While $55.6 million represents the total annual spend on aircraft maintenance and repairs, only a portion of that is directly attributable to the cost of parts and supplies. For purposes of this study, we estimate ~40% of annual maintenance spend is allocated for the purchase of parts and supplies, while the remaining 60% is attributed to labor and installation fees. This means, ~$22.24m is spent annually on aviation parts and supplies for Virginia-based non-commercial aircraft. [10]

Virginia's Aviation Parts and Supplies Tax Exemption has demonstrated significant potential in supporting the Commonwealth's aviation industry. Since its enactment, it has contributed to increased business for maintenance facilities, shifted more repair work to in-state providers, and enhanced Virginia's competitive standing compared to neighboring states. However, the study's findings represent only a partial picture of the exemption's economic impact and make it difficult without 2018 benchmarks to quantify how much the industry has grown. Furthermore, assumptions about spending on maintenance and repair, while conservative and rooted in reliable data, do not account for the full scale of Virginia's aviation ecosystem.

Quantifying the growth of Virginia's aviation industry solely as a result of the tax exemption is not currently feasible due to several factors. These include the inherent challenges of collecting data from private entities, the absence of a consistent baseline for measuring growth across such a diverse industry, and the complex interplay of various economic and regulatory influences.[11] For instance, fluctuations in fuel prices and labor shortages can significantly impact the aviation sector's costs and growth potential, while federal regulations, such as FAA maintenance requirements, and differing tax incentives in neighboring states, influence where aircraft owners choose to conduct maintenance. Although the benefits of the tax exemption are evident in qualitative terms, determining its precise impact remains difficult within the current framework.

[10] Calculation details can be found in Appendix D
[11] Additional factors include supply chain disruptions affecting parts availability, environmental regulations governing emissions and noise levels, and state or federal investments in aviation infrastructure, all of which contribute to the complexity of isolating the tax exemption's effects.

2. Methods

In September and October 2024, a survey was conducted with stakeholders to assess the value of the Virginia Aviation Parts, Engines, and Supplies Tax Exemption for the airport repair and general aviation industry. In partnership with the AOPA and NBAA, the VABA reached out to aircraft repair and maintenance operations, aircraft operators, and aircraft owners in Virginia, and the results in this paper include aggregated data from 58 respondents.

To protect participants' data, the VABA prepared a Non-Disclosure Agreement (NDA). This NDA ensured that no company-specific information was shared outside the firm compiling the overall report. All data remained confidential and was accessible only to the firm conducting the survey and preparing the final report.

In addition to the formal survey, interviews were conducted with six self-selected businesses with operations located in the Commonwealth. The same NDA covered the interview and quotes included in the results and analysis are disclosed only at the request of the company.

Many maintenance and repair businesses did not participate due to privacy concerns, as they are private entities and are hesitant to share financial data. As a result, the reported $25 million in revenue over five years significantly underrepresents the tax exemption's actual economic impact and the true amount of maintenance activity now happening in Virginia. Large operators and fractional ownership businesses conducting substantial maintenance in Virginia were also excluded from these figures.

To account for this underrepresentation, industry benchmarks from organizations like the AOPA and NBAA were used to estimate the broader impact. These estimates demonstrate that the tax exemption's importance extends well beyond the reported data, reinforcing its critical role in supporting Virginia's aviation industry. The following assumptions were made in the calculations

- **Single-engine piston aircraft**: Costs are based on standard annual inspections (required by the FAA), typical repairs, and routine upkeep such as oil changes and spark plug replacements. Sources include owner/operator reports and AOPA's ownership cost data.
- **Multi-engine piston aircraft**: Costs are higher due to additional complexity (e.g., two engines) and increased maintenance requirements, as noted in reports from aviation maintenance providers and owner/operator communities.
- **Turboprops and small jets**: Maintenance costs for these aircraft are significantly higher, factoring in inspections, parts replacements, and compliance with more rigorous FAA standards. Costs are drawn from NBAA and aircraft maintenance companies' data.

While these are reliable estimates, exact figures depend on variables such as aircraft age, usage patterns, and specific maintenance requirements. For the most precise data, maintenance cost estimates for each aircraft type would need to be sourced directly from operators, maintenance providers, or proprietary industry reports.

General aviation maintenance costs vary widely based on the type of aircraft (single-engine piston, multi-engine piston, turboprop, jet), its usage, and its condition. Below are industry estimates for an expected range of maintenance costs per year by aircraft type. To account for the fluctuations in repair needs, the average of the ranges will be used.

- **Single-engine piston aircraft**: $2,000–$5,000 annually. ($3,500 average annual maintenance cost).
- **Multi-engine piston aircraft**: $8,000–$20,000 annually. ($14,000 average annual maintenance cost)

- **Turboprops and small jets**: $30,000–$100,000 annually or more. ($50,000 average annual maintenance cost)[12]
- **Simplified Calculation Assumptions:** Assume 80% of the fleet consists of single-engine pistons
- Assume 10% are multi-engine pistons
- Assume 10% are turboprops or small jets

Calculation:

Estimated Maintenance Cost by Aircraft Type and fleet size[13]

1. **Single-engine pistons**: 6,044 × 0.80 × $3,500 = $16,923,200
2. **Multi-engine pistons**: 6,044 × 0.10 × $14,000 = $8,461,600
3. **Turboprops/small jets**: 6,044 × 0.10 × $50,000 = $30,220,000

   Total Estimated Annual Maintenance Cost:
   $ 16,923,200+ $ 8,461,600+ $ 30,220,000 = **$55,604,800**

   Average Annual Maintenance Cost per Aircraft:
   $55,604,800 ÷ 6,044 = **$9,200**

This is a conservative estimate, as actual costs can vary significantly depending on the aircraft mix and specific usage. Additionally, this estimate assumes no inflation or annual change in maintenance spend as well as no change in the number of registered aircraft in Virginia. **Industry Benchmarks for Maintenance Cost Allocation per Year:**

1. **Parts and Supplies** (30–50% of total costs)[14]:
   - Includes components like oil, spark plugs, filters, brakes, avionics, and engine parts.
   - Using a midpoint estimate of **40%**, the total annual expenditure on aviation parts and supplies would be:
     - **40% × $55,604,800 = $ 22,241,920**
2. **Labor Costs** (50–70% of total costs):
   - Covers technician hours for inspections, repairs, and compliance-related work.
   - Using a midpoint estimate of **60%**, the total annual expenditure on labor would be:
     - **60% × $55,604,800 = $ 33,362,880**

Approximate Breakdown:

- **Aviation Parts and Supplies**: **$22.24 million (40%)**
- **Labor Costs**: **$33.36 million (60%)**

[12] Information on the calculations included in Appendix B
[13] Calculation details can be found in Appendix C
[14] Calculation details can be found in Appendix D

3. **Survey Results - Overall**

Across the board, respondents overwhelmingly value the Virginia Aviation Parts Sales Tax Exemption.

90% of survey respondents identified having facilities or aircraft located in Virginia. Respondents described their roles in the aviation industry as follows: 33% identified as Aircraft Maintenance Business Owners, 55% as Aircraft Operators/Owners, 6% as Aircraft Maintenance Technicians (AMTs), and 5% as Flight School Owners/Operators.

- **Results – Aircraft Maintenance Business Owners**
  - 33% of survey respondents
  - 81% of facilities surveyed reported an increase in business since the tax exemption took effect in July 2018
  - 63% of aircraft maintenance business owners noted they've taken on or started new offerings such as avionics, interior upgrades and modernizations, other electronics, brakes, etc. work that was not competitive prior to the enactment of the tax exemption on July 1, 2018
  - 63% of business owners reported receiving work from out-of-state customers looking to benefit from the aviation parts sales and use tax exemption.
    - States facilities report receiving work from: North Carolina (22%), Maryland (16%), Florida and Georgia (9%), Pennsylvania, New York, and West Virginia (7%), South Carolin (4%), Ohio, Tennessee, Colorado, Delaware, Kansas, Texas, Maine, Michigan, and New Jersey (2% respectively)
  - All respondents indicated the tax exemption allows them to remain competitive in a fast-paced, nomadic industry.
  - 73% of Aircraft Maintenance Business Owners reported planes with a GTW less than or equal to 2,400 pounds were stored at their facility. (Number of planes stored per respondent's site ranged from 1-96)
  - Feedback from Owners/Operators:
    - "When we work on other people's aircraft – some of that cost gets passed through the supply chain anyway. The supply chain in the last five years has been turbulent with shortages and inflation. But that's how this exemption helps; it's allowed us to lower costs and help keep us competitive. This exemption has mattered."
    - "We have been able to dollar for dollar invest what we've saved from the exemption into our infrastructure, teams, and business. That's money we would have otherwise never had."
    - "Any competitive advantage helps make us attract and retain talent because of our geographical location."
    - "We want to expand in Virginia, but the potential of the exemption going away in 2025 has made us pause."
    - "The exemption is part of the bigger strategy to determine where we can most efficiently operate. If that goes away next year, I'm not going to lie, we'll look at moving what we can out of state." They furthered, "The industry is highly mobile. We've built our supply chain to adapt quickly to location changes, so it wouldn't be much of a disruption to move [out-of-state]."

- **Results - Flight Schools and Tactical Training**
  - 5% of survey respondents
  - 100% of survey respondents listed out-of-state contracts as a key portion of their business.
  - 100% of survey respondents noted the importance of the exemption on their business livelihood. "Every little bit helps," explained one owner.

- **Results – Aircraft Operators/Owners:**
  - The survey respondents expressed a strong preference for keeping their spending local and greatly value the Virginia Aviation Sales Parts Tax Exemption. They highlighted the quality, competitive pricing, and accessibility of aircraft repair services in Virginia, all of which are enhanced by this tax exemption. Maintaining the exemption is essential to sustaining these benefits.

- Within the category of aircraft owners/operators, nearly 80% of respondents confirmed that the tax exemption influenced their decision to bring maintenance and repair work to Virginia. This impact spanned a range of services, from routine annual maintenance to significant, high-value investments. Other respondent groups in the survey also provided valuable insights.
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    - 61% of survey respondents identified as aircraft owners/operators. Additionally, they reported:
        - $25 million in repairs/rework spent in Virginia between 2018-2025
        - 80% of respondents owned aircraft prior to the introduction of the tax exemption.
        - Average Fleet Size: 5 aircraft.
        - Out-of-State Repairs: 57% of owners/operators reported flying out of Virginia for aviation repairs or rework. Among these, 24% reported having work done in Florida*, 12% in Kentucky, North Carolina, and Tennessee, and 6% in Arizona, Connecticut*, Maryland, Massachusetts*, Ohio*, South Carolina, and West Virginia.[15]
        - Many respondents indicated they would seek repair and rework services out of state if the tax exemption expires.
- Feedback from Owners/Operators:
    - "Virginia's current sales tax structure keeps our small business competitive and discourages both transient and local plane owners from taking their business to Florida."
    - "Not having to manage sales tax reduces our administrative costs, allowing us to be more competitive with job pricing. This advantage has helped us attract business from multiple states and bring it here to Virginia."

- **<u>Results – Aircraft Maintenance Technicians (AMTs)</u>**
    - Representing 6% of survey respondents
    - Average career tenure among respondents: 26 years
    - 67% of AMTs surveyed reported an increase in business since the tax exemption took effect in July 2018
    - 67% of AMTs noted that their facilities have planned improvements, enhancements, or expansions that would not proceed if the legislature were to eliminate the tax exemption

[15] * Indicate states with permanent tax exemptions for aviation parts and supplies: Florida, Connecticut, Massachusetts, and Ohio

4. Analysis: Tipping the Scale

As the aerospace and aviation industry continue to expand rapidly, the Commonwealth is uniquely positioned to respond.

Despite challenges such as the COVID-19 pandemic, Virginia's aviation industry experienced notable growth since 2018, demonstrating resilience and the positive influence of the tax exemption. Based on respondent data, the industry saw average annual growth of 9.35% from 2018 to 2023, with significant year-over-year increases as follows:

- 2018–2019: 6.89%
- 2019–2020: No growth or decline (COVID impact)
- 2020–2021: 9.68%
- 2021–2022: 11.76%
- 2022–2023: 18.42%

Respondents reported 2024 to be on track with 2023 but were yet able to report increases in business for the year at the time of reporting. The trends identified herein illustrates the exemption's critical role in fostering economic development and maintaining Virginia's competitiveness.

Virginia is home to four of the five largest Aerospace Companies (Boeing, Raytheon Technologies, Northrop Grumman, and General Dynamics.) Additionally, the Commonwealth's geographical proximity Washington DC and the East Coast makes Virginia a strategically important state partner for the industry. Additionally, favorable regulations, tax exemptions (including the Aviation Parts and Sales Tax Exemption), and innovative infrastructure culminate in a unique competitive advantage for the Commonwealth's.

Beyond traditional aviation, the tax exemption has the potential to drive growth in emerging sectors such as drones, advanced air mobility (AAM), and unmanned systems, further solidifying Virginia's position as an aviation leader. Virginia is already setting pace to be a world leader in the development of aircraft that fall within this new category. Virginia is well-positioned to serve as a leader for research, design, and engineering, but the Commonwealth lags in assembly and distribution, with numerous other states already competing in these areas.

The aviation parts and supplies tax exemption holds significant relevance to these emerging sectors. These industries represent the next frontier of aviation innovation and economic growth, with Virginia positioned as a potential leader in their development and deployment. Drones and AAM platforms, including electric vertical takeoff and landing (eVTOL) aircraft, rely on sophisticated components and systems that require regular maintenance and upgrades. The tax exemption reduces operational costs for companies in these sectors, incentivizing them to base their manufacturing, maintenance, and operations within Virginia.

Unmanned systems, particularly in sectors such as logistics, agriculture, public safety, and defense, are rapidly becoming integral to the aviation ecosystem. These systems require a highly specialized supply chain for parts, sensors, and software upgrades. By maintaining and potentially expanding the tax exemption, Virginia can attract and maintain businesses that develop and support unmanned technologies, fostering a robust industry cluster. Additionally, this policy aligns with the state's broader goals of advancing workforce development in STEM fields and supporting innovation in aerospace, further solidifying its competitive advantage in the rapidly evolving landscape of advanced air mobility and unmanned systems.

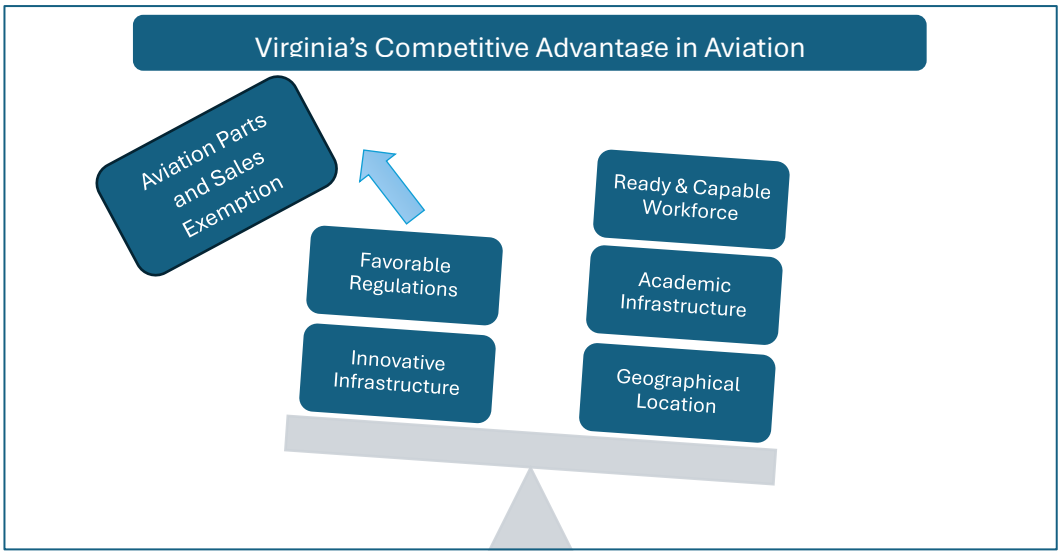
This investment by Virginia comes at a vital time for the aerospace and aviation industry. The nation and Virginia face a critical shortage of qualified pilots and aircraft maintenance technicians threatening to ground

some of the industry's growth.[16] A 2022 report by the research firm Oliver Wyman highlights that the shortage of aircraft maintenance technicians is expected to persist, placing a growing strain on the aviation industry. By 2027, — projected to be the worst year for the shortage — the bleakest statistical scenario predicts the supply deficit of aircraft maintenance repair technicians at more than 48,000 workers, or a shortfall of about 27%. Another conservative statistical model generated by the firm predicts a gap of almost 43,000, or more than 24%. Either way, the shortage of AMTs will be hard to ignore in an industry that's seen continued growth since 2021.

One respondent explained, "As a flight school owner, everything helps us keep the cost of learning how to fly down. We have a pilot and mechanic shortage, so the cost of maintenance in the last four to five years has skyrocketed. Parts have become much more expensive. What I pay my mechanics has gone up about 150% over the last four years, just to hold onto them. Anything to keep those costs under control helps us. Anything is helpful."

To alleviate pressure on the supply chain of qualified talent, industry has been working annually alongside nonprofits, businesses, advocacy organizations, and Virginia lawmakers to invest and improve opportunities for technical aerospace workforce development and training to meet growing demand in Virginia. Presently industry is working closely with numerous agencies including the Virginia Community College System, Virginia Space Grant Consortium, NASA Langley and Wallops and numerous state and private colleges and Universities.

These efforts have fostered a more competitive and resilient aviation industry in Virginia. However, the expiration of the exemption poses a significant risk, potentially shifting business to neighboring states with more favorable tax policies and incentives. Without the exemption, Virginia's aviation sector will face a decrease in force, reduced competitiveness, and diminished economic activity, destabilizing the progress achieved in recent years.



"At our core, the aviation industry is incredibly mobile," points out one aircraft maintenance business owner. "We go wherever we can to get the most affordable work done," they argue. "Owners/operators/pilots just pick up and go to another state," a point especially prevalent when located along state borders. "When you're paying $1,000 + for a part, those taxes add up fast.

Larger aircraft maintenance business owners echo similar sentiments. "As we grow, we will expand our owner-facing hubs based on demand. However, we don't invest in maintenance hubs the same way. Economics drives

[16] https://www.oliverwyman.com/our-expertise/insights/2023/jan/not-enough-aviation-mechanics.html

maintenance hub locations" explains one respondent. They continue, "if the tax exemption [in Virginia] goes away, we'll shift our maintenance to Maryland or other states. We can easily build a supply chain around a hub."

Another large aircraft maintenance owner communicated their desire to expand in Virginia, "but the lack of clarity on the tax exemption's future, makes it hard." One flight school owner explained, "We plan to bring more aircraft to Newport News which means more maintenance done locally. If this tax exemption was eliminated, we would analyze the business case of moving out of Virginia." The nomadic nature of the aviation industry is a double-edged sword. These companies have invested deeply into our communities, workforce, and economy, but the threat of the aviation parts and sales tax exemption's expiration threatens to push companies, jobs, and economic potential out of the Commonwealth.

Companies operating large fractional ownership fleets face significant maintenance costs driven by fleet size, aircraft composition, and utilization. For example, a company with approximately 700 aircraft, including midsize jets like the Citation XLS and large jets like the Gulfstream G550, incur annual maintenance expenses estimated between $500 million and $1 billion. Similarly, a smaller fleet of 200-300 aircraft, featuring high-end models such as the Embraer Praetor 600 and Bombardier Challenger, sees maintenance costs ranging from $200 million to $400 million annually.

Maintenance expenses are influenced by aircraft type, with midsize jets costing $500,000–$1,000,000 per year per aircraft and large jets ranging from $1,000,000–$3,000,000 annually. Fractional ownership companies also experience heavy aircraft utilization compared to private owners, requiring more frequent inspections, part replacements, and engine overhauls. These factors highlight the critical importance of cost efficiencies and favorable tax environments for operators managing large, high-performing fleets. Virginia is presently hosting maintenance operations for multiple fractional ownership companies. Because of the mobility of these aircraft, maintenance will move to the states with the best maintenance pricing of which the tax is part of the cost.

The security and stability of the aviation industry is dependent on many factors, but every aircraft maintenance business owner who participated in the survey argued that a qualified workforce was one of the most important factors. "The juxtaposition of the Commonwealth pushing and advocating for expanding educational opportunities to develop our workforce, alongside the threat of taking away a tax exemption that allows us to be competitive and need a developing workforce seems contradictory," one aircraft maintenance business owner explained. "We need everything we can get," another respondent concluded.

Presently the exemption excludes aircraft with a GTW less than or equal to 2,400. This bifurcation of the exemption harms the industry and increases costs for smaller operations, especially flight school thus driving up the cost of training because of relocating aircraft for maintenance and taking the aircraft out of service for longer periods of time. The current limitation disproportionately impacts smaller aircraft, which constitute a significant portion of the general aviation fleet. For example, many of the 60 flight schools across Virginia operate fleets, consisting of aircraft in this category. These schools are essential to the aviation ecosystem, training future pilots and contributing millions annually to the state's economy through routine maintenance and operational spending. One flight school alone, operating a fleet of more than 50 aircraft, spends millions on annual maintenance. Extrapolating this to the statewide network of flight schools underscores the substantial economic activity tied to these smaller aircraft.

Smaller aircraft are still highly mobile and can be easily relocated to neighboring states with more favorable tax policies, such as Maryland, North Carolina, and Tennessee, which offer broader exemptions. While owners of such aircraft may have minor maintenance performed locally, high dollar upgrades and engine overhauls are easily relocated out of state where the tax by itself will make it far more reasonable in price. This mobility makes it financially practical for operators to move their aircraft for maintenance, taking valuable business and tax revenue out of Virginia. Retaining this restriction places Virginia-based maintenance facilities at a competitive disadvantage, limiting their ability to attract and retain customers in a highly price-sensitive market.

By removing the gross takeoff weight limitation, Virginia fosters a stronger competitive environment to attract both jobs and business expansion through an inclusive tax policy that supports all segments of the aviation industry, from small flight schools to larger fractional ownership and charter operations.

5. **Recommendations**
   a. **Establish more robust mechanisms for tracking and analyzing the aviation industry's economic activity**
   Given the conservative nature of these estimates and the absence of a clear pre-2018 benchmark, it is recommended that Virginia establish more robust mechanisms for tracking and analyzing the aviation industry's economic activity. Such efforts would allow for more precise assessments of the tax exemption's impact and provide a stronger foundation for future policy decisions.

- **b. Permanent Extension of Tax Exemption would be valuable for Virgina Aircraft Repair Economy**
  - 81% of facilities surveyed reported an increase in business since the tax exemption took effect in July 2018
  - 63% of aircraft maintenance business owners noted they've taken on or started new offerings such as avionics, interior upgrades and modernizations, other electronics, brakes, etc. work that was not competitive prior to the enactment of the tax exemption on July 1, 2018
  - 63% of business owners reported receiving work from out-of-state customers looking to benefit from the aviation parts sales and use tax exemption.
    - States facilities report receiving work from: North Carolina (22%), Maryland (16%), Florida and Georgia (9%), Pennsylvania, New York, and West Virginia (7%), South Carolin (4%), Ohio, Tennessee, Colorado, Delaware, Kansas, Texas, Maine, Michigan, and New Jersey (2% respectively)

Between 2018 and 2024, aircraft owners and operators in Virginia reported spending $25 million on maintenance and repairs at aviation facilities within the Commonwealth.

- The aviation parts sales and use tax exemption has significantly strengthened Virginia's aviation industry, driving business growth, attracting out-of-state customers, and expanding service offerings. Permanently expanding this exemption will solidify Virginia's position as a competitive leader in aviation services, supporting economic growth and innovation across the Commonwealth.

- **c. Extension of Tax Exemption to Aircraft Weighing with a GTW less than or equal to 2,400 pounds would attract all to Virginia Aircraft Repair Economy**
  - The current tax exemption excludes aircraft with a gross takeoff weight of less than 2,400 pounds, creating a significant barrier for smaller aircraft owners and operators. Despite this, **81% of aircraft maintenance business owners** surveyed reported doing work on planes under this weight threshold, highlighting the demand for maintenance in this category. However, **68% of all aircraft maintenance facilities** indicated that some work is still being performed out of state, with aircraft owners frequently taking their business to neighboring states like Maryland, Pennsylvania, West Virginia, and Florida, where tax policies are more favorable.
  - Survey respondents unanimously agreed that extending the tax exemption to include planes with a GTW less than or equal to 2,400 pounds would incentivize them to bring **additional maintenance work** for smaller aircraft back to Virginia. As one respondent noted, "We had more business on planes less than 2,400 lbs gross takeoff weight prior to the revised bill," illustrating the impact of the weight restriction.
  - Additionally, maintenance for smaller planes often involves small margins on parts and supplies, making tax savings a critical factor in decision-making. A respondent explained:

- "While customers looking for an oil change and minimal annual maintenance may not feel it worth the while to go out of state, they are very aware of the benefits of not paying sales tax for major upgrades that are typically time-consuming and could be carried out in other states without sales taxes. Opening up sales tax exemptions for smaller aircraft could well open the floodgates to additional work from owners who have preferred to sit on the sidelines."
- Furthermore, the respondent emphasized that smaller aircraft, despite their size, are increasingly valuable and warrant high-end upgrades. This creates an opportunity for Virginia to capture substantial business in avionics upgrades, refurbishments, and other maintenance projects that currently flow out of state. By removing the 2,400-pound restriction, Virginia can level the playing field, incentivize in-state maintenance, and unlock a significant growth area in its aviation industry.
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Implementing these recommendations would position Virginia as a leader in the aviation maintenance and repair industry while ensuring sustained economic growth. Establishing robust mechanisms for tracking economic activity would provide critical insights into the impact of the aviation parts sales tax exemption, enabling more informed policy decisions. Permanently extending the tax exemption would solidify Virginia's competitive edge, as evidenced by the significant business growth and out-of-state customers drawn to the state since the exemption’s enactment. Finally, expanding the exemption to include aircraft with a gross takeoff weight of less than or equal to 2,400 pounds would address existing inequities, attract additional maintenance work, and unlock new opportunities for upgrades and refurbishments. Together, these steps would create a stronger, more competitive aviation economy in the Commonwealth, benefiting businesses, aircraft owners, and the industry at large.

Appendix A: Survey Questions

- Does your operation, business, or aircraft fleet operate in Virginia?
- First and Last Name
- Company Name
- Phone Number
- Email
- Please select the option that best describes you:
- Any other business description you'd like to provide?
- Were you an aircraft owner/operator prior to July 1, 2018?
- Do you own or lease your plane?
- How many aircraft do you own or lease?
- Please identify the category, class, and type of aircraft you own/lease.
- How long have you owned or operated an aircraft?
- Are you financially responsible for the maintenance of your plane(s)?
- Do you have maintenance performed on your aircraft in Virginia?
- Do you have maintenance performed on your aircraft outside of Virginia?
- If you have maintenance performed on your aircraft outside of Virginia, where do you have it done?
- If you have maintenance and/or upgrades performed on your aircraft, please describe the type of work performed and why you chose the location for the work.
- Did Virginia's preferential tax policy influence your decision to have work performed on your aircraft in that location?
- What was the dollar value of work or repairs done on your aircraft in Virginia for each year? Please provide the amounts for 2018, 2019, 2020, 2021, 2022, 2023, and 2024 for each year.
- Do you own/operate any planes with a takeoff weight <=2,400 pounds?
- What state(s) do you currently service your plane(s) that weigh less than or equal to 2,400 pounds?
- Would a permanent extension of Virginia's aviation parts sales and use tax exemption to aircraft <= 2,400 pounds incentivize you to have all maintenance work done in Virginia?
- Do you own or lease your plane?
- How many aircraft do you own or lease?
- Please identify the category, class, and type of aircraft you own/lease.
- How long have you owned or operated an aircraft?
- Are you financially responsible for the maintenance of your plane(s)?
- Do you have maintenance performed on your aircraft in Virginia?
- Do you have maintenance performed on your aircraft outside of Virginia?
- If you have maintenance performed on your aircraft outside of Virginia, where do you have it done?
- If you have maintenance and/or upgrades performed on your aircraft, please describe the type of work performed and why you chose the location for the work.
- Does the current parts and supplies tax exemption incentivize you to have any maintenance, repair, overhaul, upgrades, modernization, or other work performed on your aircraft at a Virginia-based maintenance and repair shop?
- Did the current parts sales and use tax exemption impact your decision to become an aircraft owner and/or operator?
- What was the dollar value of work or repairs done on your aircraft in Virginia for each year? Please provide the amounts for each year you've been an owner or operator in the industry. Years we're interested in are: 2018, 2019, 2020, 2021, 2022, 2023, and 2024.
- If the current parts sales and use exemption expires in 2025, to what state(s) do you think you would travel for aircraft maintenance and upkeep?
- Do you own/operate any planes with a takeoff weight <=2,400 pounds?
- What year was your maintenance facility opened?

- Has overall business increased at your facility since July 1, 2018?
- Has your business taken on or started new offerings such as avionics, interior upgrades and modernizations, other electronics, brakes, etc. work that it was not competitive prior to the enactment of the tax exemption on July 1, 2018?
- Are you getting work from out-of-state customers looking to benefit from the aviation parts sales and use tax exemption?
- What state(s) are those customers coming from?
- Does your business have any improvements, enhancements, or expansions planned that you would not proceed with if the legislature eliminated the tax exemption?
- How many planes with a takeoff weight less than or equal to 2,400 pounds are at your facility?
- How many of planes with a takeoff weight <=2,400 pounds are getting maintenance work done at your facility?
- If the planes <=2,400 pounds are not getting maintenance work done at your facility, where are they traveling to?
- Is there anything else you'd like to share with us?
- What year did you become a certified aircraft maintenance technician?
- How many years have you been working at your current maintenance facility?
- Have you worked at any previous maintenance facilities?
- Has your workload increased at your facility since July 1, 2018?
- Have you or the facility where you work taken on or started new offerings such as avionics, interior upgrades and modernizations, other electronics, brakes, etc. work that it was not competitive prior to the enactment of the tax exemption on July 1, 2018?
- Are you getting work from out-of-state customers looking to benefit from the aviation parts sales and use tax exemption?
- What state(s) are those customers coming from?
- Do you or your facility have any improvements, enhancements, or expansions planned that you would not proceed with if the legislature eliminated the tax exemption?
- How many aircraft with a takeoff weight of less than or equal to 2,400 pounds are getting maintenance work done at your facility?
- If the aircraft with a takeoff weight less than or equal to 2,400 pounds are not getting maintenance work done at your facility, where are they traveling to?
- How many people does your business employ?
- How would you describe the makeup of your facility?
- How would you describe the makeup of your facility?
- Would the permanent passage of the aviation parts sales and use tax exemption incentivize you to move any of your operator/fleet to Virginia?
- Is there anything else that could incentivize you to move a portion or all of your operator/fleet to Virginia?

Appendix B: Sources for Aircraft Maintenance Cost Estimates

1. The maintenance cost estimates provided for different types of aircraft are based on general industry knowledge, historical data from various sources, and typical cost ranges observed in the aviation community. Below is a breakdown of how these estimates were derived: Single-engine piston aircraft: $2,000–$5,000 annually
    - This cost range represents the typical maintenance expenses for single-engine piston aircraft, such as the Cessna 172, Piper Cherokee, or similar models. These aircraft are relatively simple and have lower operating costs compared to more complex aircraft. Maintenance typically includes annual inspections, routine engine servicing, parts replacements (e.g., tires, spark plugs, batteries), and other minor repairs. Maintenance costs are lower for aircraft with lower flight hours (typically under 100 hours per year) and may increase with the age of the aircraft.
    - Sources for this estimate include general aviation ownership and operation guides from Aircraft Owners and Pilots Association (AOPA), Flying Magazine, and Aviation Consumer, which regularly publish articles on operating and maintenance costs for various aircraft.
2. Multi-engine piston aircraft: $8,000–$20,000 annually
    - Multi-engine piston aircraft, such as the Beechcraft Baron or Piper Seneca, generally incur higher maintenance costs due to their additional engine, more complex systems, and the need for more frequent inspections and servicing. These aircraft require more extensive maintenance, including engine overhauls, detailed inspections, and repair of complex avionics and systems. The cost range reflects aircraft with moderate annual flight hours and regular usage.
    - This estimate is based on information from Flying Magazine and General Aviation News, which frequently discuss the operating costs of multi-engine aircraft and the added complexity of maintaining dual engines and associated systems.
3. Turboprops and small jets: $30,000–$100,000 annually or more
    - Turboprop and small jet aircraft, such as the Pilatus PC-12, Cessna Caravan, or light jets like the Citation Mustang, require significantly higher maintenance budgets due to their complex turbine engines, advanced avionics, and systems that demand specialized knowledge. These aircraft often have scheduled maintenance requirements that are more frequent and costly, including engine inspections, overhauls, and repairs, as well as compliance with strict manufacturer and regulatory guidelines. For small jets, this range may increase significantly depending on factors like aircraft age, usage, and the manufacturer's recommended maintenance intervals.
    - Maintenance cost estimates for turboprops and small jets are derived from resources like Aviation Consumer, Flying Magazine, and manufacturer-specific maintenance schedules, which outline the typical operating expenses and associated repair costs for these more complex aircraft.

While these estimates provide a useful baseline for understanding maintenance expenses, they do not account for potential price changes due to inflation, which could significantly impact actual costs over time. For precise and up-to-date information, aircraft owners and operators should refer to manufacturer guidelines, maintenance manuals, and local service providers.

Appendix C: 2018 Aircraft Maintenance Spending Calculations

The following calculations are based on the assumed fleet size of 6,044 aircraft in Virginia and the estimated population breakdown for each category of aircraft. The spending estimates are derived from industry-standard maintenance cost ranges for each aircraft type.

1. **Single-engine piston aircraft (80% of the fleet):**
    - Fleet size: 6,044 × 80% = 4,835 aircraft
    - Average annual maintenance cost per aircraft: $3,500
    - Total spending: 4,835× $3,500 = $16,923,200
2. **Multi-engine piston aircraft (10% of the fleet):**
    - Fleet size: 6,044 × 10% = 604 aircraft
    - Average annual maintenance cost per aircraft: $14,000
    - Total spending: 604 × $14,000 = $ 8,461,600
3. **Turboprops and small jets (10% of the fleet):**
    - Fleet size: 6,044 × 10% = 604 aircraft
    - Average annual maintenance cost per aircraft: $50,000
    - Total spending: 604 × $50,000 = $ 30,220,000

Total Annual Spending:

$ 16,923,200 + $ 8,461,600+ $ 30,220,000 = $55,604,800

Note,

- The average annual maintenance cost estimates do not account for potential increases due to inflation.
- For simplicity, fleet size is assumed to be static, despite reported annual growth by the FAA. [17]

[17] https://www.faa.gov/licenses_certificates/aircraft_certification/aircraft_registry/releasable_aircraft_download

Appendix D: Allocation of Maintenance Spend on Parts and Supplies

The 40% allocation for parts and supplies as a share of maintenance costs is an estimation based on industry-standard benchmarks and general practices within the aviation maintenance sector. While there isn't a single definitive source for this exact percentage, the estimate is drawn from multiple authoritative organizations and studies that analyze aviation maintenance economics.

The estimate that parts and supplies constitute approximately 40% of maintenance, repair, and overhaul (MRO) costs in the aviation industry is supported by several industry analyses. For precise references in your research paper, consider the following sources:

1. Federal Aviation Administration (FAA) Report: The FAA's "Aircraft Operating Costs" report provides detailed insights into the breakdown of operating expenses for air carriers. It indicates that direct costs, which include maintenance expenses, account for about 50% of total costs for major passenger air carriers. While the report does not specify the exact percentage allocated to parts and supplies, it offers a comprehensive overview of maintenance-related expenditures.
2. Oliver Wyman's Global Fleet and MRO Market Forecast 2023-2033: This report projects that the global commercial aviation fleet will expand by 33% to over 36,000 aircraft by 2033, with corresponding growth in the MRO market. While it does not provide a specific percentage for parts and supplies, it offers valuable context on overall MRO spending trends.
3. IATA's Aircraft Maintenance Cost Data eXchange (MCX): The International Air Transport Association (IATA) collects maintenance cost data from over 50 airlines worldwide. Their reports provide detailed breakdowns of maintenance costs, including expenditures on labor, materials, and other categories. While specific percentages may vary, these reports can offer insights into the proportion of costs attributed to parts and supplies.

Please note that the exact percentage of MRO costs attributed to parts and supplies can vary based on factors such as aircraft type, airline operations, and maintenance practices. The 40% figure serves as a general industry estimate.