Aviation 2.0 — Explained

A new operating standard for preventing congestion at commercial airports

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1. Executive Summary

Exhaustless Inc. is establishing congestion-free flight service with the Aviation 2.0 Operating Standard (A2OS) to provide reliable schedules and reduce travel times at high-demand airports.

A2OS bundles patented and patent-pending innovations to insert the Exhaustless Inc. ('our' and 'we') third-party Aviation 2.0 Congestion Prevention Service (A2CPS) that relieves chronic flight-congestion by preventing the over-scheduling of flights. We reduce flight volumes to congestion-free levels, then concurrently introduce market-based mechanisms to allocate supply and demand within those levels. We allocate the congestion-free airport capacity to carriers through seasonal slot auctions and meter that volume to passengers and freight carriers with market-based congestion-prevention premiums. These changes create and maximize new competitive market-forces that will lead to improved passenger experience and a more profitable industry.

A2CPS empowers carriers to improve service by enabling competitive markets to deliver congestion-free service, thus "placing maximum reliance on competitive market forces" and on "actual and potential competition" as prescribed in the Airline Deregulation Act. This replaces the activity of regulators in setting acceptable delays, and so requires a new operating standard for airlines.

A2OS maneuvers the industry through legal, economic, and technological hurdles to convert some of the more than $41 Billion of annual congestion-delay costs to new industry profit. Significant new profit-potential for airlines — from reduced congestion-delay costs — incentivizes them to license A2OS. The improved industry cost structure will attract the investment in innovations needed to overcome flight volume limitations in crowded cities. Our method of approach is cooperative, but with urgency. Security risks, health impacts, and economic losses from congestion-delays harm the industry and the nation.

Exhaustless will begin to rollout A2OS in **January 2020** by allocating the excess demand for existing carrier flight reservations to passengers and freight for five currently constrained airports: LaGuardia (LGA), JFK, Newark Liberty (EWR), Hartsfield-Jackson Atlanta (ATL), and Philadephia (PHL). Next, Exhaustless will conduct an auction on **April 8, 2020** for congestion-free flight reservations at John F. Kennedy International Airport (JFK), Newark Liberty International Airport (EWR), and LaGuardia Airport (LGA) for the Winter 2020/2021 season.

Exhaustless will coordinate the rapid and cooperative migration to the new standard of congestion-free flights — the future of aviation.

2. The Aviation Experience Today

Aviation passengers today pay to upgrade their service in many ways. They pay for larger seats and better food service in business class. They pay for nicer, quieter lounges while they wait at the airport, for expedited security screening, for priority boarding. Yet they are unable to pay to affect the two fundamental aspects of service quality – the time required for travel and the reliability of the schedule.

Airlines are also unable to affect the time required for travel and the reliability of the schedule. That is because, at the busiest airports, peak-time flight volumes are too high and often lead to chronic congestion delays. As chronic congestion-delay costs from the idling flight crew and aircraft grow, margins on passenger seats shrink. To maintain profitability, airlines focus on marginal revenue from higher numbers of smaller seats with added à la carte pricing and baggage fees. Since airlines cannot affect service quality, they compete on what they can affect — price. Those cheap airfares come with a hidden, ever-increasing cost to passengers — and their employers — in schedule-uncertainty and increased travel time from congestion delays.

And because the law prohibits regulators from setting price or service, they can only seek a compromise between runway gridlock and carrier monopoly through rulemaking. There has been no progress on the big problem of reducing the congestion that causes delays. And, there are no other solutions on the horizon; neither NextGen, privatizing air traffic control, nor day-of-travel flow management address chronic delays from over-scheduling.

The industry is operating as a quasi-regulated economic environment rather than the deregulated environment enacted by Congress in 1978. Coupled with today's suppressed profitability —from delay costs — this deters both external and internal investment in aviation throughput. This frustrates passengers, airlines, and Congress, and has resulted in misplaced blame and increasing stress surrounding air travel.

The industry is stuck.

Aviation 2.0 helps the industry move forward to an era where timely takeoffs are the norm — with no chronic congestion-delays — and where passengers continually fund innovators to improve the industry. Fair, open, and transparent competition among passengers and among airlines aligns with the spirit and letter of the Airline Deregulation Act to restore schedule certainty, profitability , and sanity to air travel.

3. Impacts of Congestion

Congestion is physical competition between two or more objects attempting to occupy the same space at the same time. The presence of chronic congestion is a sign that competitive market forces are not at work — a competitive market would increase prices until there is no congestion, which would provide the funds to increase capacity to serve the excess demand.

Chronic congestion-delays increase travel time and reduce the reliability of travel schedules. Reducing these delays has been a matter of importance to the aviation industry and to Congress for many decades.

Chronic flight-congestion is a critical problem that causes covert economic and health costs, and serious security risks.

a. Delay costs of congestion

In 2010, NEXTOR[1] released their FAA-sponsored Total Delay Impact Study (TDIS). The researchers modeled air traffic network delays by looking at statistical utilization of congested airports - where flight operations are over-scheduled and don't have enough buffer to handle random fluctuations, leading to flight cancellations and delays. Their estimate for the **annual** cost of delays, in 2019 dollars, was **$41B**; $21B incurred by passengers, $10B by airlines, $5B in lost tourism, and $5B in lost GDP. This cost estimate was based on time-value, not market-value —it is currently unknown how much airlines and passengers are willing to pay to avoid delays.

To put this amount in perspective, the $10B annual cost of congestion to airlines was *1.5 times more than* the U.S. airlines' free cash flow for 2018.[2]

b. Health costs of congestion

In 2014, researchers at UC Berkeley[3] published a study to determine if airport pollution causes respiratory illnesses. Their findings show the very real losses suffered by families

[1] http://www.isr.umd.edu/NEXTOR/pubs/TDI_Report_Final_10_18_10_V3.pdf

[2] Airlines for America, "Industry Review: Allocating Capital to Benefit Customers, Employees and Investors", Aug. 21, 2019.

[3] http://faculty.haas.berkeley.edu/rwalker/research/SchlenkerWalker_Airports_2014.pdf

downwind from aviation congestion. The findings estimate that congestion leads to $5B in annual health care cost for families in California alone.[4]

Recent studies have shown that exposure to aircraft noise increases heart attacks, high blood pressure, strokes, and learning difficulties in children.[5]

c. Security risks of congestion

ADSE-X7 time-lapse videos[6] of LaGuardia show a spatial aspect to the congestion, which helps visualize the excessive risk created by crowding aircraft — full of fuel and people — in takeoff queues on the tarmac. The danger to takeoff lines stems from their easy targeting by assailants with standard weapons[7] – especially for airports nestled among neighborhoods, like LaGuardia. The economic impact of this risk — which would be second to the human impact — dwarfs the other categories due to the 5% of GDP linked to commercial aviation.

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4 The findings estimate that congestion leads to $500M in annual health care cost for California families, but experts in drug development acknowledge that due to the limited Medicare data on the subject the true market numbers are typically 10x higher than the hospitalization data used.

5 http://www.independent.co.uk/life-style/health-and-families/features/how-noise-pollution-can-affect-your-health-a6853746.html

6 https://www.youtube.com/watch?v=O2dg1750aXk

7 Such as drones.

4. Aviation 2.0 Operating Standard

Exhaustless Inc. is establishing congestion-free flight service with the Aviation 2.0 Operating Standard (A2OS) to provide reliable schedules and reduce travel time at high-demand airports. A2OS encompasses the Aviation 2.0 Congestion-Prevention Service (A2CPS) and all other Exhaustless technologies as they become available.

A2OS bridges legal and market gaps in commercial aviation. A2CPS will set flight volumes to congestion-free levels, then concurrently introduce market-based mechanisms to allocate supply and demand within those levels. These changes create and maximize new competitive market-forces that will lead to improved passenger experience and a more profitable industry.

a. Congestion-Prevention Service

Exhaustless' patent-pending[8] A2CPS prevents congestion by limiting passenger and freight carrier reservations to the congestion-free capacity of the airport. A2OS prioritizes scheduled reservations, enabling airlines to improve customer service to their passengers. Carriers that license A2OS may employ A2CPS. Neither the airport nor regulators interfere with, or have any right to, the collection of the slot[9] auction proceeds from carriers, nor the passenger or freight Congestion-Prevention Premiums from carriers.

On the supply side, we facilitate a market where airlines compete for the congestion-free flight-reservations for each airport via seasonal auctions among FAA-licensed carriers. On the demand side, we facilitate a market in which passengers and freight carriers compete by paying a premium to fly at times when market demand exceeds the congestion-free volume of scheduled flights. The premiums will vary in response to changes in excess passenger demand relative to congestion-free capacity. [10]

Passengers will drive the industry away from a maximum-utilization model and toward a minimum-congestion, maximum-throughput model. A2CPS reduces the peak-utilization level of congested airspaces to improve schedule recovery and resilience of the system to weather and other unplanned events.

Airlines will meet the passenger needs of reliable flight schedules, price certainty, and price transparency — without the hidden cost of delays.

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[8] System and Method for Managing Air Traffic Data: U.S. Patent Application 15/789,585; International PCT patent has entered the national stage.

[9] A 'slot' is a flight reservation for a specific time of day, day of the week, and season of the year.

[10] See Appendix F: Testing and Proving the Aviation 2.0 Congestion-Prevention Service.

1) Supply Management: Flight Volume

There are three steps to managing the volume of flights at high-demand airports to prevent excess supply and reduce the chronic delays caused by over-scheduling flights:

a) Measure the congestion-free capacity: New Flight-Reservations

The airspace for NYC is shared by JFK, LGA, EWR, and other nearby airports, which necessitates all three airports to coordinate their operating runways. This requires frequent changes in the operating runway configurations, which take setup time and further reduce throughput. Additionally, the different runway configurations have varied throughput capabilities. Because the operating runway configuration is determined by wind, weather, and operations at other nearby airports, the runway throuhput cannot be known at the time that slots are reserved. To provide congestion-free flights, we measure the capacity of the airports based on analysis of the actual operating throughput and delays of each runway configuration during normal operations[11]. This allows us to more accurately estimate the capacity of the coordinated airspace.

Current methods used by the Department of Transportation (DOT) and Government Accountability Office (GAO) to determine airport slot-limits rely on modeled averages of airport capacity, rather than actual operations. This overstates capacity during certain runway configurations, leading to excessive delays.[12]

Prior to each auction, Exhaustless will recalibrate the volume of congestion-free flight-reservations based on analysis of the airport operating data and changes to capacity. The new congestion-free slots have a **one season term**. The flight seasons, winter and summer, are currently set by the International Air Transport Association.

b) Allocate the congestion-free capacity: Competitive Auctions

Exhaustless will conduct seasonal ascending-bid auctions to allocate the new congestion-free slots. All FAA-licensed carriers are eligible participants. The auction proceeds will be revenue to Exhaustless.

The first auction will be for the three major airports in the NYC airspace — LaGuardia, JFK and Newark Liberty — which all currently operate under regulatory

[11] For more information, see our white paper "Measure Real Capacity to Prevent Chronic Delays." (Nov. 2019).

[12] For other ways the current method overstates capacity, see Appendix D: NYC Metro – A Unique Overscheduling Problem.

flight limits. All information about the auction, including the timeline and the rules and procedures, is available at www.airportslotauction.com.

Exhaustless will notify the FAA and the airport authority of the market derived reservations.

c) Prioritize the congestion-free capacity: New Operating Procedures

Under A2OS, the airport assures its airline customers that all commercial flight reservations are competitively allocated by Exhaustless' Aviation 2.0 Congestion-Prevention Service by refusing to give unscheduled commercial flights access to gates or airport facilities, except in cases of emergency.[13]

This procedure is necessary because all of the capacity has been competitively allocated to scheduled flights. Unscheduled, non-competitive flights may not interfere with these scheduled flights because that would be an unfair practice (and thus illegal).

The Aviation 2.0 Licensing Agreement delineates this change to airport operating procedures.

In addition, airports may want to develop their own new operating procedures that prioritize the on-time service of the congestion-free flight-reservations. This will be a completely different mindset from the current priority of maximizing utilization and will require training. These procedures establish a congestion-prevention mode of operating the airspace.

2) Demand Management: Congestion-Prevention Premium

A2CPS prevents excess demand by charging passengers a dedicated Congestion-Prevention Premium (CPP) on the airfare when they reserve their flight. The premium increases as excess demand increases — driving more demand to off-peak hours. We expect that most of the flights at most of the airports will have no premium because those airports do not experience volume-related delays. Freight carriers will pay the CPP corresponding to the aircraft weight and flight time, as determined by excess passenger demand. CPP will be revenue to Exhaustless.

[13] The authority over flight reservations would be delegated to the competition of the auction, not to any airport authority. See Appendix E: The Role of Regulators under the Airline Deregulation Act.

Patent-pending software[14] extends the existing airfare publication system. It calculates the market-based premium by incorporating delay models into a dynamic pricing-process. Initial values are set using elasticity. An algorithm increases or decreases the premium to maintain rates of ticket sales to within expected ranges — and thereby redirects excess demand to off-peak-time flights. The premium price will be static in the initial software version and may change more frequently with each new version as we incorporate more data and gain more experience.

Spreading the passenger demand to fit the new flight volume will allow the maximum utilization of the airport's aggregate congestion-free flight capacity[15]. Passengers will have the choice to pay a premium to travel during peak-times — with no congestion delays, or to fly at off-peak times with a lower premium — also with no congestion delays. As off-peak demand increases, carriers will find it more profitable to compete for those customers.

b. Innovative technologies that increase capacity

Exhaustless has patented two flight technologies that increase throughput in congested airspaces with today's fleet — by reducing wake intensity and runway occupancy. They also generate less noise and air pollution while separating takeoffs and landings.

To understand wakes, go back to the fundamental property of flight, which is that lift for flight comes from wings accelerating air downwards. There are two ways to accelerate air downwards:

- ***Slowly*** accelerate a ***large*** mass of air: *Slow* departure flight speed creates a large, slow-moving mass of air which makes for slower dissipating wakes that restrict departure rate and airport capacity.
- ***Quickly*** accelerate a ***smaller*** mass of air: *Quick* departure flight speed creates a small, fast-moving mass of air which makes for faster dissipating wakes, which is key to higher departure throughput and more slots.

[14] System and Method for Managing Air Traffic Data: U.S. Patent Application 15/789,585.

[15] Spreading the passenger demand will also reduce congestion and maximize utilization of the entirety of the airport's infrastructure and the supporting transportation infrastructure provided by cities.

Our patents exploit these insights into wake intensity to move the industry forward to an era where improved air transportation meets the needs of passengers, airport employees, and the surrounding communities with increased, sustainable capacity. *Aligning the goals of passengers with the local airport communities will drive innovation instead of mitigation.*

1) Patented Takeoff System

Grid-powered propulsion increases the takeoff acceleration rate and velocity of today's unmodified aircraft to increase departure throughput *while reducing noise*. Higher takeoff velocities reduce departure wake intensity — and the time required between airplanes. Flights spend less time accelerating, climbing, and waiting for interfering wakes to dissipate.

Uncoupling the takeoff energy from onboard the aircraft to the grid reduces jet fuel used in takeoff and climb by 43%, or in the average total flight by 6%. This enables growth of the aviation industry in urban environments without building new airports.

2) Patented Thrust Recovery System

Compressed air stored during descent allows for reduced-throttle landings that shrink wake intensity and expedite reverse-thrust recovery after touchdown to reduce runway occupancy and increase landing throughput *while reducing noise*. Flights spend less time waiting between wakes, and less time slowing down on the runway.

c. Future technologies envisioned

1) Secondary slot market

Once the primary market (scheduled flight reservations) is established and stable, Exhaustless will develop secondary slot markets for airlines to trade reservations.

2) Tertiary slot market

Once the secondary slot market is established and stable, the private sector will need to develop tertiary slot markets where unscheduled flights can compete for any excess capacity related to fluctuating operating conditions during the day.

3) Airport tools

As we implement A2OS, we anticipate improving the Standard to include tools needed by airports to improve the efficiency of airport operations related to the new congestion-prevention environment.

5. Impacts to the Industry and its Investors

A2CPS creates significant new profit-potential for airlines[16] and airports from reduced delay-costs and depeaked demand[17]. The improved quality of earnings for airlines will lead to increased stock prices and lower costs of capital, increasing the airlines market capitalization[18] an estimated 33% to 203% (or $47 to $285 Billion). See Figure 1 below.

Figure 1 Potential Market Capitalization of Airlines with Congestion-free Operations (in 2017 USD Billions)

The improved economics of the industry will attract the investment in innovations to overcome flight volume limitations in large cities. New investments continue the migration to a self-sustaining, self-innovating, and more competitive industry. Passengers benefit from this increased competition — with no chronic congestion-delays, airlines will be able to compete on service quality and choice by offering more customized service to their target markets.

A2OS empowers airlines to improve service by relying on competitive markets to deliver congestion-free service, rather than relying on regulators to anti-competitively balance market forces between delays, new entrants, and monopoly airlines. Airlines have been reluctant to

[16] See Appendix A: New Earnings Potential for U.S. Airlines Domestic Operations.

[17] Reduced delays will also increase the tourism industry, which NEXTOR estimates loses $5B annually.

[18] See Appendix B: Potential Added Market Capitalization for U.S. Airlines.

relinquish their grandfathered slots in the past because the DOT could not reduce congestion. Our approach leverages the new profit-potential and our path to future capacity to motivate airlines to license A2OS.

Two favorable factors contribute to a quick industry transition. First, the innovation for A2CPS consists of offsite software integrated with airline software, so it does not require investments from airports. And second, airlines need to transition to A2OS for flight reservations for only 12 to 15 congested domestic airports[19] to relieve most of the congestion-delays. The airline flight scheduling procedures for non-congested airports will not change.

This rapid and cooperative transition — free of court challenges over slot restrictions or airport fees — leads to a more stable and secure industry.[20] Exhaustless will coordinate the migration among airlines and the airfare-publication system to A2OS, the new standard for congestion-free, delay-free flights — the future of aviation.

[19] https://www.faa.gov/airports/planning_capacity/media/FACT3-Airport-Capacity-Needs-in-the-NAS.pdf

[20] See Appendix G: Persuading Airlines and Airports to Migrate to A2OS.

6. Historical Perspective

Congressional hearings about flight delays go back over 40 years. Representatives have repeatedly asked the FAA and the GAO how to reduce delays at congested airports. They answer "add capacity" because that is the only legal tool they have. But they don't know how to add capacity for airspace-constrained regions using existing technology.

The DOT and the FAA lack statutory authority to collect market-based premiums because Congress has structured the industry to rely on market forces (rather than regulation) to set price, route, and service. Without a market mechanism to efficiently allocate capacity, regulators set flight (slot) limits at a few congested airports, but they have to be careful not to promote monopolistic conditions that stifle competition. To compensate for slot limits that are set too high, they mistakenly maximize slot utilization at the expense of congestion delays[21] and with minimal consumer protections. This maximizes competitive *physical* forces, rather than maximizing competitive *market* forces prescribed by the Airline Deregulation Act.

When demand exceeds capacity in a deregulated industry, the market limits peak-use to prevent congestion-delays. Economists and regulators have long understood that excessive flight volumes cause chronic congestion[22], and that a market mechanism to allocate flight capacity, such as a slot auction, would promote competition[23,24].

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[21] LGA average delay has increased from 65 minutes in 2012 to 78 minutes last-twelve-months as of June 2019.

[22] "… reducing the level of operations, e.g. through tighter slot controls, should have a positive benefit, despite potential fare changes… policies and mechanisms that limit the level of operations at airports should be considered in concert with capacity enhancements to insure effective use of new capacity in order to reduce flight delay and its associated costs." - NEXTOR TDI Report, October 2010

[23] "Straight caps without some mechanism to ensure an efficient allocation of scarce slot resources is economically inefficient … Market-based pricing has been demonstrated time and again as the most effective way to allocate a scarce resource that is in high demand… Pricing can balance demand with available capacity, resulting in less congestion and more reliable schedules." - Statement of D.J. Gribbin, General Counsel, U.S. Department of Transportation before the House Subcommittee on Aviation, Concerning Aviation Congestion Management, June 18, 2008.

[24] "With the clamor rising over airport delays … this paper advocates the use of market mechanisms, specifically slot auctions, to promote efficient usage of airport capacity, reduce airport delays, and, more generally, promote competition." - Antitrust Division, U.S. Department of Justice, Economic Analysis Group Discussion Paper EAG 07-14: Proposal for A Market-Based Solution to Airport Delays, October 2007.

Reducing peak-time demand with congestion pricing is also not a new concept. In 2009, the DOT adopted a policy that allowed airports to increase landing fees to airlines during peak-demand times, to encourage them to land at off-peak times. The DOT abandoned the policy when they determined that this would increase airline costs without reducing flights as needed to prevent congestion.

After examining the historical attempts of the industry to reduce congestion, and the related court rulings, we developed A2OS to work uniquely within the legal framework of the Airline Deregulation Act and anti-trust laws. Our solution recognizes that there are two congested markets – the supplier market and the consumer market — and the capacity must be allocated with market-based prices to each market.

Exhaustless' authority to charge and collect congestion premiums from airlines and passengers derives from Constitutional intellectual property rights coupled with the Airline Deregulation Act — that requires price and service to be set by competitive markets. A2CPS is in the public interest and solves the long-term congestion management problem, replacing slot management regulations with market-based services.[25]

[25] The history of congestion management since deregulation is summarized in the proposed rule titled "Slot Management and Transparency: LaGuardia John F. Kennedy International and Newark Liberty International Airports at https://www.regulations.gov/document?D=FAA-2014-1073-0001; See the section 'LaGuardia Airport after AIR-21".

7. New Perspective

Analyzing air transportation from a systems-engineering and economics perspective, we define and frame the problem in a new way, which leads to fresh solutions.

a. This is an ordinary market

Congress devised the Airline Deregulation Act to convert air transportation into an ordinary marketby requiring innovations to come from the private-sector. A2OS is a market-based solution that meets the intent of deregulating the industry.

In an ordinary market, reservations receive the highest priority when allocating capacity. And any excess demand leads to increased prices which drive investment in innovation and improvement.

b. The limited airspace is the bottleneck

The limiting resource at most congested airports is not runways and gates[26] — it is the airspace itself.

Commercial aircraft produce enormous wakes during takeoff and landing that must dissipate before the air can support the next airplane. The heavier the airplane, the more intense the wake. Yet, to increase capacity at congested airports, the industry has increased the size and weight of airplanes, and the time required for the larger wakes to dissipate. This has led to increased delays.

Exhaustless' patented flight technologies increase the throughput of the airspace by exploiting these insights in wake intensity. But rather than wait to increase capacity, the industry must first — with urgency — migrate to a competitive method of allocating existing capacity to reduce congestion-delays and their egregious costs.

c. Airlines are the suppliers

The historical perspective is that airlines are the consumers of runway space. But airlines are the suppliers, responding to the service demand of the passengers. Regulators have attempted to reduce the excess supplier demand with congestion fees. However, under

[26] The court ruling on changes to airport landing fees explains the industry perspective: https://www.faa.gov/airports/airport_compliance/media/uscourtappeals-airports-rates-charges-jul2010.pdf

deregulation, the limited airport capacity that must be allocated with competition in the private sector.

d. Passengers are the consumers

Regulators realized they could not affect passenger prices under deregulation. But the passengers and freight-carriers are the consumers in this market, so to prevent excess consumer demand, we must also charge them a congestion premium.

With A2OS, Exhaustless gives passengers the market power to shape service quality, like an ordinary market.

e. Aviation needs two types of airports

There are airports that have excess market demand where airlines need a market-based mechanism to allocate capacity, and there are airports that do not have excess market demand. The needs of these two types of airports are different, and the market must differentiate access to meet both of their needs.

Currently, there are many airports in the NAS that are congested, but instead of using a market-based congestion management service they use a regulator-based, pre-deregulation, anticompetitive schedule coordination.

8. The NYC Market Rollout

The world hates change, yet it is the only thing that has brought progress.
Charles Kettering

It is well known that the New York City metropolitan region is the epicenter of chronic congestion-delays. But the cause of these delays is not well known, which is that the DOT/FAA's method of measuring capacity uniquely overstates the flight capacity in the NYC market, leading to egregious overscheduling at the busiest airspace in the country.[27] And because NYC is on the east coast, it has the first flights of the day that impact later flights across the rest of the nation. Reducing delays in NYC will have a significant impact on trade and the national airspace.

Our goal is to help move NYC airports to the top of the Bureau of Transportation Statistics (BTS) on-time service rankings.

Exhaustless will begin rolling out A2OS for flights to and from the five[28] currently constrained airports identified in the Federal Aviation Administration's FACT3 Report (Jan. 2015) — LaGuardia (LGA), John F. Kennedy International (JFK), Newark Liberty International (EWR), Hartsfield-Jackson Atlanta International (ATL), and Philadelphia International (PHL)— in several stages:

a. Passenger Congestion-Prevention Premium for Phase 1 Airports

Begining in **January 2020,** Exhaustless will begin charging the passenger Congestion-Prevention Premium (CPP) as a separate line item to the airfare. The CPP is collected by the airline with the airfare and paid to Exhaustless. Exhaustless calculates the CPP for each slot at each airport. The CPP software will interface with the airfare publishing software to update the price. Exhaustless does not anticipate any changes to the initial CPP for flights scheduled during the Winter 2019/2020 or Summer 2020 seasons. We anticipate monthly changes to the CPP for flights scheduled during the Winter 2020/2021 season.

b. Freight Congestion-Prevention Premium for Phase 1 Airports

The freight CPP will take effect at the same time as the passenger premium, but as a per-flight charge. Price lists per slot and per airport will be published on our website. Pricing changes will follow changes to the passenger CPP. In special cases where there are hybrid

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[27] See Appendix D: New York City Metro – A Unique Overscheduling Problem

[28] We will refer to these five airports (LGA, JFK, EWR, ATL, PHL) as the "Phase 1" airports.

passenger and cargo flights, the premium will be split based on payload. Freight carriers will pay the premium directly to Exhaustless.

c. NYC Metro Airports Auction for Winter 2020/2021

Next, Exhaustless will conduct an auction on **April 8, 2020** for congestion-free flight reservations to and from John F. Kennedy International Airport (JFK), Newark Liberty International Airport (EWR), and LaGuardia Airport (LGA) for the Winter 2020/2021 season. The U.S. Winter 2020/2021 season is from October 25, 2020 to March 27, 2021 as set by the International Air Transport Association.

d. Phase 1 Airports Auction for Summer 2021

The second auction will be for reservations for flights to and from all five Phase 1 airports (JFK, EWR, LGA, ATL, and PHL) and is expected to be on **September 2, 2020** for the Summer 2021 season capacity.

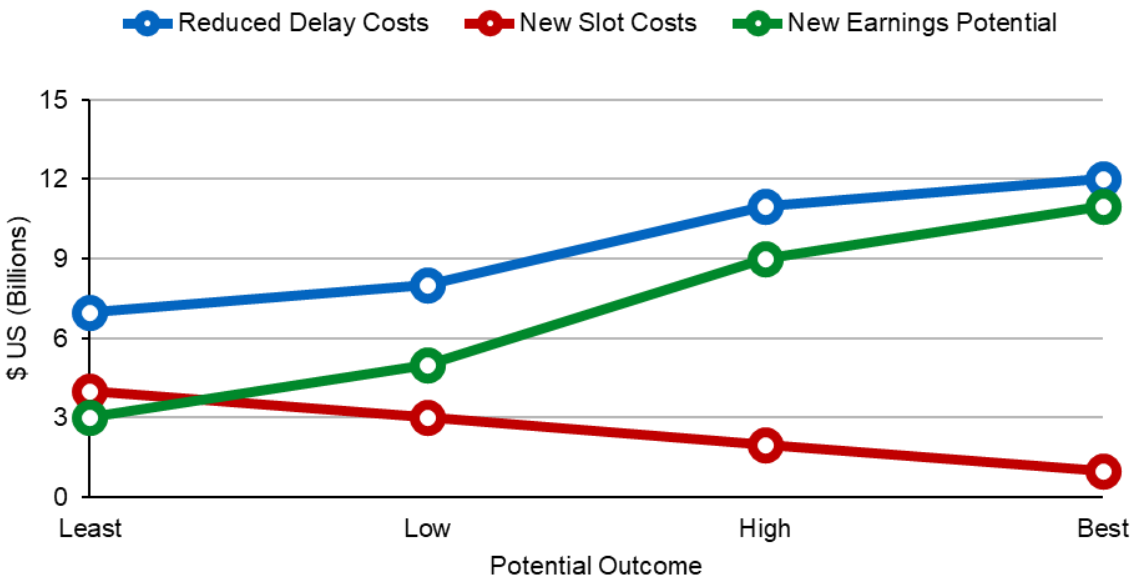
We expect to see at least a 30% reduction in total-delay time after one year of reduced volume, as measured using a combination of Bureau of Transportation Statistics (BTS) and FAA Aviation System Performance Metrics (ASPM) data. The results may establish A2OS as a long term solution to congestion management for the National Airspace System.

9. Appendix A: New Earnings Potential for U.S. Airlines Domestic Operations

From Adoption of Exhaustless' Aviation 2.0 Operating Standard
In 2017 USD Billions

	Reduced Delay-Costs[1]	New Slot Costs[2]	New Earnings Potential[3]
Least	7	4	3
Low	8	3	5
High	11	2	9
Best	12	1	11

1. The range of airline losses to congestion delays comes from NEXTOR Total Delay Impact Study and FAA updates.
2. For comparison, using the bids from the 2011 FAA mini-slot auction, which included no large carriers, would cost $138M per airport.
3. This is based on implementation at 10 airports, but experts estimate that 50-80% of nationwide delays stem from the three NYC region airports.



10. Appendix B: Potential Added Market Capitalization for U.S. Airlines

From Adoption of Exhaustless' Aviation 2.0 Operating Standard
In 2017 USD Billions

			Added Market Cap from:			
	New Earnings Potential	New PE[1] Ratio	Lower Delay Cost	Increased PE Ratio	Combined	Increase[2]
Least	$3	11	$33	$14	$47	**33%**
Low	$5	13	$65	$42	$107	**76%**
High	$9	15	$135	$70	$205	**146%**
Best	$11	17	$187	$98	$285	**203%**

1. The Price to Earnings ratio will rise with the congestion-free cost structure and higher quality earnings. The 2017 PE ratio for domestic airlines was at 10.
2. Based on the US Domestic Airlines Market Cap of $140.3B, Source: New York Times Feb 21, 2018. Despite record passenger volumes and a strong economy, the market cap has declined 11% to $125.3B as of Nov. 20, 2019. Contributing factors were now-resolved labor disputes and the suspension of operations of the Boeing 737 Max. The significant potential of A2OS to increase the industry's market cap by 30% to 200% remains.

11. Appendix C: Aviation 2.0, Treaties, and Open Skies Agreements

In *Exhaustless v. FAA*, 931 F.3d 1209 (D.C. Cir. 2019), the FAA wrongly speculated that the U.S. could not comply with international agreements on commercial air travel, and specifically the treaty with Canada which guarantees Canadian airlines 42 slots at LaGuardia. *See* Air Transport Agreement Between the Government of the United States and the Government of Canada, T.I.A.S. No. 07-312, Ann. II § 1 (Mar. 12, 2007).

Aviation 2.0 aligns with the open skies agreements and the Airline Deregulation Act. The current anticompetitive regime is at odds with the intent of international agreements designed to open access to fair, market-based airline competition.

a. Open Skies Agreements:

According to the U.S. State Department website:

"Open Skies agreements are bilateral air service agreements the U.S. Government negotiates with other countries to provide rights for airlines to offer international passenger and cargo services. They are pro-consumer, pro-competition, and pro-growth. They include reciprocal obligations to eliminate government interference in commercial airline decisions about routes, capacity, and pricing, so airlines can provide more affordable, convenient, and efficient air service to consumers, promoting increased travel and trade, and facilitating broad economic growth."

And from the Canadian Agreement:

"The Parties acknowledge that market forces shall be the primary consideration in the establishment of prices for air transportation. Intervention by the aeronautical authorities shall be limited to: (a) prevention of unreasonably discriminatory prices or practices; (b) protection of consumers from prices that are unreasonably high or restrictive because of the abuse of a dominant position; (c) protection of airlines from prices to the extent that they are artificially low because of direct or indirect governmental subsidy support; and (d) protection of airlines from prices that are artificially low, where evidence exists as to an intent of eliminating competition." Article 6.

This agreement was one reason that Exhaustless filed for patent protection of our congestion-prevention service in Canada.

Today, Canada has little control over which U.S. slots are allocated to its airlines. The best way Canadian airlines can gain access to their preferred slots is to compete for them in the

auction. Moreover, Canada's airlines will benefit from Exhaustless' service since all flights at LaGuardia will endure less congestion delays under Aviation 2.0.

b. Ways the U.S. can comply with these agreements under Aviation 2.0.

There are at least four ways that the U.S. can comply with the agreement under Aviation 2.0.

1. The U.S. and Canadian governments could agree that these private sector changes are in line with the agreement, and do not require an amendment. The treaty outlines processes for sharing operational changes (See Article 16).
2. The U.S. and Canadian governments could agree to amend the agreement. The treaty outlines processes for making ammendments to the agreement , if necessary (See Article 18).
3. The U.S. government could instruct Exhaustless to set aside certain slots for Canada for reimbursement by the U.S. government at the market rate.
4. The U.S. government could instruct Exhaustless to set aside certain slots for Canada and grant Exhaustless anti-trust immunity for this discriminatory practice. Although this would seem antithetical to the spirit of the agreement.

12. Appendix D: New York City Metro – A Unique Overscheduling Problem

The DOT/FAA's method of measuring capacity uniquely overstates the flight capacity in the NYC market, leading to overscheduling that causes egregious delays that permeate the entire national airspace. Therefore, implementing this solution at any other airport in the nation would not prove that it would help NYC congestion – the cause of an estimated 75% of the national airspace congestion delays.

Unlike other congested airports, the three NYC Metro airports share an overlapping airspace. The wakes created during takeoff and landing by current flight technology and flight paths propagate across this distance, so the airports must coordinate their activity. Wind and weather conditions at one airport dictate which runway configuration to operate, which dictates the runway configurations at the other two airports. This coordination requires many more runway configuration changes than at other congested runways — even when there is no bad weather — which takes time and reduces throughput. The current capacity estimation method used by the FAA does not account for this interrelationship.

Other limitations in the method include:

- The Flaw of Averages/Aggregation of multimodal data: The different runway configurations can have significantly different throughputs due to the different levels of interference between arriving and departing flights. This type of operation is considered 'multimodal' because each mode, or runway configuration, has different throughput and delay characteristics. The FAA overstates capacity for approximately 90% of the operating runway configurations by selecting the mode with the highest throughput under optimal conditions as the nominal achievable capacity. It is extremely inefficient to set a schedule based on such unreliable throughput.
- Excludes impact to passengers: FAA ASPM data reports delays by flight, irrespective of how many passengers are on board. There is no analysis or consideration of the aggregate impact to passengers.
- Jensen's Inequality: Simulation tools are used to compute an average throughput across all modes that do no take into account the delays —which is inappropriate in setting reliable schedules for a transportation system. This overstates capacity, which overdrives the queues into unstable growth conditions that are beyond the well-behaved assumptions required of the math. The patent application for the Congestion-Prevention Service contains time-series analysis that shows the extremely non-linear and unstable behavior of delays during good weather. There is currently no reliable way to predict which runway configuration or sequence of configurations might be used in advance.

- Assumes that all delays are reasonable: The FAA method considers any delay up to a cancellation as "tolerable". But airlines are reluctant to cancel flights from NYC because of the downstream effect it will have on their nationwide schedules for the day.
- Misguided authorization: The DOT sets the flight limits to the highest range of the FAA's estimated range of capacity — which has been overstated in at least four ways —in order to maximize utilization, its substitute for market competition.

Our patent-pending process was designed to measure the congestion-free capacity of each airport, overcoming these limitations in the current method.[29]

[29] See our white paper "Measure Real Capacity to Prevent Chronic Delays." (Nov. 2019), for a more detailed explanation of our process.

13. Appendix E: The Role of Regulators under the Airline Deregulation Act

The purpose of the DOT includes developing transportation policies "considering the needs of the public, users, carriers, [and the] industry…" that "contribute to providing fast, safe, efficient, and convenient transportation at the lowest cost" while making easier the "*development of transportation service provided by private enterprise*" 49 U.S.C. § 101(a),(b)(2),(b)(6) (emphasis added).

The FAA Act of 1958, directs the FAA Administrator to "develop plans and policy for the use of the navigable airspace and assign by regulation or order the use of the airspace necessary to ensure the safety of aircraft and the efficient use of airspace."; and "prescribe air traffic regulations on the flight of aircraft[.]"49 U.S.C. §§ 40103(b)(1), (2).

Prior to deregulation, regulators controlled all aspects of air transportation; they set flight volumes, determined which airlines could provide which routes, and set prices. In 1968, the FAA promulgated the High Density Rule (HDR), which limited operations at five airports, including LGA and JFK. "The justification for instituting the HDR was the efficient management of air traffic, and safety was not a factor in adoption of the rule." [30] Prior to deregulation, slot reservations under the HDR "were initially allocated through airline scheduling committees, operating under then-authorized antitrust immunity, and the airlines would agree to the allocation." [31]

In 1978, Congress enacted the Airline Deregulation Act to ensure that competitive market forces would set the price, routes, and service of air transportation. It instructed the Secretary of the DOT, among other things, to:[32]

- "plac[e] maximum reliance on competitive market forces and on actual and potential competition— to provide the needed air transportation system; and to encourage efficient and well-managed air carriers to earn adequate profits and attract capital."
- avoid "conditions that would tend to allow [a] carrier to . . . exclude competition in air transportation."

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[30] "Airports, air traffic control, and related concerns", by United States Department of Transportation, Task Force on Competition in the U.S. Domestic Airline Industry (Feb. 1990).

[31] 71 Fed. Reg. at 51361

[32] 49 U.S.C. §40101(6), (10), and (12).

- "encourage[e] competition to provide efficiency [and] innovation" in air transportation.

After deregulation, however, no private-sector market-based solution to competitively allocate limited airspace capacity emerged.

In 1985, the FAA amended the High Density Rule, establishing new slot allocation procedures to replace the scheduling committees. These anticompetitive procedures included allocating the slots to the carrier that last held the slot, with a right of first refusal, for free. These are fundamentally the same procedures currently in place.

Until now.

Under Aviation 2.0, the authority over the market allocation of capacity will be delegated to the market competition of the slot auctions and Congestion-Prevention Premiums, as intended by deregulation — with no involvement by regulators nor by airport authorities.

Aviation 2.0 contemplates no changes to the law. The FAA continues to develop plans and policy for the use of the airspace and the safety of flight. Under the ADA, the Secretary shall "preven[t] unfair . . . or anticompetitive practices in air transportation". 49 U.S.C. §40101(9). The DOT could help ensure a smooth transition to A2OS by establishing the necessary consumer protections.

14. Appendix F: Testing and Proving the Aviation 2.0 Congestion-Prevention Service

The economic mechanisms employed in Aviation 2.0 are well studied, established, and in practice. In fact, the patent office is now diverting any patent asserting claims over escrow, auctions, and other standard business practices because they are part of the fabric of knowledge. None of these is a new concept or practice — they just have not been applied in this way along with a patented capacity calibration process to implement congestion pricing. The patent provides a nationally consistent service for congestion prevention that is aligned with deregulation as it maximizes market competition.

- Reducing flight volumes will reduce congestion — that is the FAA's current practice through its scheduling limits at LGA, JFK and EWR — but they must balance those reductions with the risk of creating monopoly airlines because they have allocated the free slots with free rights of first refusal.
- Allocating slots to airlines through an auction is what economists have proposed as the economically most efficient method, and indeed what the FAA/DOT proposed doing themselves in 2008 but without Congressional authorization. Exhaustless will introduce its auction service in a lawful and responsible way through tested deployments with training and mock auctions for carriers.
- Managing flights with operating authorizations is the FAA's current practice at LaGuardia, JFK, and Newark Liberty[33].
- Charging consumers a higher premium reduces excess demand for a scarce resource.
- Incorporating a dynamic or static third-party fee into airfares, such as the Congestion-Prevention Premium (CPP), is quite simply what Airline Tariff Publishing Company (ATPCO) does as a normal course of business. The à la carte baggage fees, seat upgrades, and passenger specific options that have been deployed over the past decade are line items stored on the airfare by ATPCO and are provided by airlines through a common interface multiple times per day. Exhaustless would be responsible for integrating its software with Airline Tariff Publishing Company's software, and would pay ATPCO to update the airfare software .

[33] These are called 'reference identification numbers' at Newark. See Notice of Submission Deadline for Schedule Information, 84 Fed. Reg. 18630, 18632 (May 1, 2019).

- Calibrating the CPP based on elasticity and demand profiles ensures that the price is discovered through the market, and not monopolistic pricing. Exhaustless will introduce its patent-pending service in a lawful and responsible way through phased releases of tested deployments. The phases start with static congestion premiums from market estimates that become incrementally more dynamic with evidence of service reliability. We do not anticipate any changes to the initial CPP for flights scheduled during the Winter 2019/2020 or Summer 2020 seasons. We anticipate monthly changes to the CPP for flights scheduled during the Winter 2020/2021 season.

The Court has already found it reasonable for passengers and airlines to pay congestion premiums to fly at peak periods[34], and did not find any hurdles for Exhaustless to collect the Congestion-Prevention Premiums from passengers and the slot auction proceeds from carriers[35]. The only remaining question is how to responsibly roll out the migration to Aviation 2.0.

[34] *Air Transp. Ass'n of Am. v. U.S. Dep't of Transp.*, 613 F.3d 206, 214 (D.C. Cir. 2010)

[35] *Exhaustless v. FAA*, 931 F.3d 1209 (D.C. Cir. 2019).

15. Appendix G: Persuading Airlines and Airports to Migrate to A2OS

The Aviation 2.0 Operating Standard was developed to insert competitive, market mechanisms that comply with antitrust laws and which are lacking in the air transportation market. We envisioned a cooperative transition with airlines and airports — free of court challenges over regulatory slot restrictions or airport fees. But if airlines are unwilling to voluntarily upgrade to a more profitable, lawful, competitive solution, the following actions may be taken:

a. Airports have the authority to deny service to any carrier not acting according to the law. Under A2OS, airport authorities that license the standard would ensure that commercial flight reservations were competitively allocated. Which means that all airlines operating at those airports would have to license A2OS to participate in the auction.

b. The DOT may compel airlines to act by instructing ATPCO to add the passenger CPP line item to the airfare and by prohibiting commercial flights that are not competitely allocated at airports where Exhaustless offers the slot auction.

c. Exhaustless could file for injunctive relief to preclude anticompetitive practices in transportation service at airports.

d. Exhaustless could file a private antitrust claim against airlines or ATPCO, which could come with risks of treble damages.

e. The DOJ could file antitrust claims against airlines and request the court to order airlines to divest of ATPCO to get rid of its associated antitrust tendencies (highlighted by the past DOJ consent decree) and potentially move it under Exhaustless. This would reduce the ability for airlines to collude through ATPCO.