United States Government Accountability Office

Report to Congressional Addressees

October 2021

COVID-19 PANDEMIC

Observations on the Ongoing Recovery of the Aviation Industry

Accessible Version

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GAO-22-104429

GAO Highlights

Highlights of GAO-22-104429, a report to congressional addressees

October 2021

COVID-19 PANDEMIC

Observations on the Ongoing Recovery of the Aviation Industry

Why GAO Did This Study

International flight restrictions, local stay-at-home orders, and a general fear of contracting and spreading COVID-19 through air travel had a sudden and profound effect on the U.S. aviation industry. According to Department of Transportation (DOT) statistics, passenger traffic in April 2020 was 96 percent lower system-wide than April 2019, and remained 60 percent below 2019 traffic levels throughout 2020.

This report examines (1) immediate effects of the COVID-19 pandemic on businesses across the aviation industry; (2) actions those businesses took in response; (3) actions the FAA took to help the industry respond to the pandemic; and (4) the outlook for industry recovery, among other issues.

GAO reviewed DOT airline operational and financial data from calendar years 2019 through 2020, financial statements from various aviation-related businesses, FAA regulations and operational guidance, and industry recovery forecasts. GAO conducted a generalizable survey of 1,136 smaller airports. GAO also interviewed officials from FAA and representatives from a judgmental sample of 47 aviation and aerospace industry stakeholders selected based on location and industry sector.

What GAO Recommends

GAO continues to urge Congress to take legislative action to require DOT to work with relevant agencies, stakeholders, and members of the aviation and public health sectors to develop a national aviation-preparedness plan for communicable disease threats.

View GAO-22-104429. For more information, contact Heather Krause at (202) 512-2834 or krauseh@gao.gov.

What GAO Found

The COVID-19 pandemic severely affected the aviation and aerospace sectors that depend on commercial passenger travel. As demand for air travel plummeted and remained low throughout 2020, effects cascaded across sectors including U.S. passenger airlines, airports, aviation manufacturers, and repair station operators. For example, in response to reduced demand, airlines parked or retired a substantial portion of their aircraft fleet, which, in turn, reduced demand for aircraft maintenance services.

Aircraft Temporarily Stored at Denver International Airport in 2020

Source: Denver International Airport. | GAO-22-104429

In response to the pandemic's effects, aviation stakeholders reported that they acted quickly to mitigate financial losses and position themselves to maintain business viability until demand increased. Stakeholders' actions included:

- managing costs, such as by implementing early retirement programs;
- raising funds in the private market to increase liquidity; and
- taking steps to mitigate COVID-19's spread among employees and customers.

Stakeholders also noted the importance of the over $100 billion in payroll support payments, loans, and other financial assistance provided through COVID-19 relief legislation.

The Federal Aviation Administration (FAA) reported taking quick action to help the aviation industry adjust operations in response to the pandemic. These actions included providing temporary relief from some regulatory requirements—such as airline crewmember medical certifications—and issuing guidance to airlines and airports on mitigating COVID-19 risks. FAA has phased out many of these relief measures.

Although airlines experienced a rebound in demand for U.S. leisure travel in 2021, operational challenges and concerns about the COVID-19 Delta variant have slowed recovery. Forecasts suggest that industry recovery will be uneven as business and international air travel—the most profitable segments—are likely to lag. Stakeholders identified areas of concern for policymakers to consider, such as strengthening aviation workforce pipelines, as they determine how or whether to continue to assist the industry in evolving market conditions. Further, developing a national aviation-preparedness plan for communicable disease, as GAO recommended, would provide greater coordination among federal and industry stakeholders and help better prepare the U.S. for future pandemics.

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441 G St. N.W.
Washington, DC 20548

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The Coronavirus Disease 2019 (COVID-19) pandemic has resulted in catastrophic loss of life and substantial damage to the global economy. The global aviation industry was among those most severely affected. International flight restrictions, local stay-at-home orders, and a general fear of contracting and spreading COVID-19 through air travel had a sudden and profound effect on the global aviation industry, including passenger airlines, airports, and the entire ecosystem of businesses that supply, manufacture, and repair commercial and general aviation aircraft.

According to Bureau of Transportation Statistics (BTS) data, U.S. airline passenger traffic was down 60 percent system-wide in 2020 compared to 2019 traffic levels.[1] The ripple effect from this unprecedented and sustained reduction in demand throughout 2020 has affected airline business models, employment, and the entire aviation supply chain.[2] In response to the pandemic, the Coronavirus Aid, Relief, and Economic Security (CARES) Act and subsequent COVID-19 relief laws appropriated over $100 billion to provide financial assistance to the U.S. aviation industry and its workers.[3]

You asked us to conduct a broad review to gather input from a wide range of stakeholders, including airlines, airports, aviation labor, general aviation users, commercial space companies and others, on several key

[1]BTS is the Department of Transportation's source for commercial aviation, multimodal freight activity, and transportation economics.

[2]For example, according to the Bureau of Labor Statistics (BLS), as of April 2021—the most recent data available—an estimated 136,400 jobs in the air transportation and support activities sectors—approximately 22 percent—have been lost since peak employment levels of 755,400 in February 2020, although employment has risen roughly 7 percent since October 2020. According to BLS, the air transportation sector includes scheduled air carriers that fly regular routes on regular schedules and operate even if flights are only partially loaded, and non-scheduled carriers that provide chartered air transportation of passengers, cargo, or specialty flying services and often operate at nonpeak time slots at busy airports. Among other things, the support activities for air transportation sector includes airport operations and air traffic control.

[3]CARES Act, Pub. L. No. 116-136, §§ 4003, 4112, 134 Stat. 281, 470, 498 (2020); Consolidated Appropriations Act, 2021, Pub. L. No. 116-260, div. N, tit. IV, 134 Stat. 1182, 2052-61 (2020); American Rescue Plan Act of 2021, Pub. L. No. 117-2, § 7301, 135 Stat. 4, 104-107.

issues related to the industry and federal response to the COVID-19 pandemic, including:

- the effects of the COVID-19 pandemic on selected aviation and aerospace industry sectors in 2020;
- actions selected aviation and aerospace stakeholders took in response to the pandemic;
- actions taken by the Federal Aviation Administration to help the aviation industry respond to the pandemic, and selected aviation stakeholders' perspectives on those actions; and
- the outlook for aviation industry recovery, and stakeholder considerations for potential federal support in assisting the aviation industry in the future.

To identify the effects of the pandemic on selected aviation industry sectors and their respective responses to the pandemic, we analyzed the Department of Transportation's (DOT) Form 41 financial and operational data for calendar years 2019 and 2020. We determined that these data were sufficiently reliable for the purposes of our reporting objectives by reviewing the quality control procedures used by DOT. We also analyzed financial statements reported to the Securities and Exchange Commission (SEC) by publicly-traded airlines and other aviation-related businesses from the first quarter through the fourth quarter of 2020 to obtain quantitative information on their financial performance, as well as qualitative descriptions of the impact of the pandemic on businesses and actions those businesses took in response.[4] We reported on the immediate effects of the pandemic based on the expectation that other effects will be long-term. We conducted interviews with a judgmental sample of 47 aviation and aerospace industry stakeholders—including passenger airlines, cargo airlines, large and medium hub airports, and aviation manufacturers—on the effects of the COVID-19 pandemic on

[4]The four quarters cover the 12 months of calendar year 2020.

selected aviation and aerospace industry sectors and actions stakeholders took in response.[5]

We also conducted a generalizable, web-based survey of smaller airports— including small hub, non-hub, non-primary commercial service, general aviation, and reliever airports—to identify the effects of the pandemic on these airports and actions they took in response.[6] The survey response rate was 72 percent.[7] Estimates generated from these survey results are generalizable to the target population of 2,752 smaller airports in the continental U.S.[8]

To identify the actions the Federal Aviation Administration (FAA) took to help the aviation industry respond to the pandemic, we reviewed requests for regulatory relief submitted to FAA by aviation stakeholders and FAA's

[5]We selected aviation and aerospace industry stakeholders to represent a cross-section of sectors within the aviation and aerospace industries as well as based on geographic representation. The stakeholders we selected include an analytics and engineering firm; 9 industry associations; 2 aviation labor organizations; 6 passenger airlines; 3 cargo airlines; 5 aviation manufacturers; 3 repair station operators; 11 large and medium hub airports; 2 commercial space launch providers; 3 credit rating agencies, and 2 aviation industry analysts.

[6]We conducted the survey from November 16 through December 11, 2020. We used a sampling frame of 2,752 airports (64 small hub, 209 non-hub, 63 non-primary commercial service, and 2,416 general aviation and reliever airports). Large and medium hub airports, non-primary airports with an unclassified role, airports outside of the continental U.S., and proposed airports were excluded from the sample frame. Small hub airports are those that account for at least 0.05 but less than 0.25 percent of annual passenger enplanements; non-hub airports are those that account for less than 0.05 percent of passenger enplanements but have more than 10,000 enplanements annually; non-primary commercial service airports have at least 2,500 and no more than 10,000 annual enplanements.

[7]This is the unweighted response rate. The weighted response rate was 65 percent. Following best practices in survey research and in Office of Management and Budget, *Standards and Guidelines for Statistical Surveys* (September 2006), we carried out a nonresponse bias analysis. The nonresponse bias analysis and subsequent weighted adjustments only included variables available on the National Plan of Integrated Airport Systems (NPIAS) sample frame and did not account for unobserved variables that could potentially be related to the likelihood of response. However, based on our knowledge of aviation operations, we did not expect survey responses or the likelihood of response to vary by other airport characteristics. Based on this nonresponse bias analysis and resulting nonresponse-adjusted analysis weights, we determined that estimates using these weights are generalizable to the population of smaller airports and are sufficiently reliable for the purposes of our reporting objectives.

[8]Unless otherwise noted, all estimates from this survey have a margin of error of plus or minus 10 percentage points or less, at the 95 percent confidence level.

related rulemakings, exemptions, and extensions, as well as operational guidance. We interviewed officials from FAA divisions responsible for implementing these actions as well as those of the 47 aviation and aerospace stakeholders selected whose operations were potentially affected by these actions.

To describe the outlook for aviation industry recovery and considerations for the federal role in assisting the aviation industry, we reviewed forecasts published by aviation industry stakeholders, including aviation-related businesses, consulting firms, and credit rating agencies, and synthesized their findings. We also interviewed the 47 aviation and aerospace industry stakeholders described above to obtain their perspectives on considerations for federal assistance, and reviewed our prior work on civil aviation and on federal assistance to the private sector.[9] See appendix I for additional details on our objectives, scope, and methodology, including a list of stakeholders interviewed.

We conducted this performance audit from July 2020 to October 2021 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Background

Civil Aviation and Aerospace Sectors

The U.S. civil aviation and aerospace industries are vital contributors to the domestic and global economies. Airlines generate billions of dollars in revenue annually and contribute to the economic health of the nation. These industries are a complex and dynamic ecosystem that includes, among many other entities, passenger airlines that provide scheduled and non-scheduled service, cargo airlines, airports, aviation

[9]See, for example, GAO, *Sustained Federal Action is Crucial as Pandemic Enters Its Second Year,* GAO-21-387 (Washington, D.C.: Mar. 31, 2021), and GAO, *Financial Assistance: Lessons Learned from CARES Act Loan Program for Aviation and Other Eligible Businesses*, GAO-21-198 (Washington, D.C.: Dec. 10, 2020).

manufacturers of airplanes and engines, businesses that provide aircraft maintenance services, and the commercial space industry.[10]

Passenger Airlines

Airlines that provide scheduled commercial passenger service are often grouped into categories including network, low-cost, and regional airlines. Most network airlines operate complex hub-and-spoke operations with thousands of employees and hundreds of aircraft. These airlines provide service at various levels to a wide variety of domestic and international destinations. Low-cost airlines tend to operate less costly point-to-point service mostly to domestic airports using fewer types of aircraft. Regional airlines operate smaller aircraft, turboprops, or regional jets with up to 100 seats, and generally provide service to smaller communities under capacity purchase agreements with network airlines.[11] Some regional airlines are owned by a network airline, while others are independent. Airlines that provide scheduled commercial passenger service may also carry cargo—called "belly cargo"—in any excess space on the lower decks of their aircraft. Other aircraft operators provide unscheduled, charter, and on-demand passenger service and include air taxis and business jets.[12]

Since the airline industry was deregulated in 1978, its earnings have been volatile.[13] Notably, the demand for air travel tends to fluctuate in relation to the state of the economy as well as to political, international, and health-related events. For example, in the last 20 years, global air travel demand has been disrupted by events including 9/11, the SARS outbreak of 2002-03, and the 2008 global financial crisis. However, airlines

[10]Other entities within the industry include businesses that supply various resources to airlines, including catering companies and fuel suppliers; airport tenants such as rental car companies, parking operators, and gift and retail concessionaires; smaller businesses in the aviation manufacturing supply chain, including parts and component suppliers; and business involved in the manufacture and operation of drones.

[11]Under a capacity purchase agreement, network airlines contract with regional airlines to provide air service beyond the network airline's own route structure to increase their capacity and revenue. Agreement terms vary, but network airlines generally take on all commercial functions, such as brand marketing, flight scheduling, and ticket pricing, while the regional airlines are responsible for the aircraft and crews to operate the flights and provide ground and flight operations.

[12]See 14 C.F.R. pt. 135.

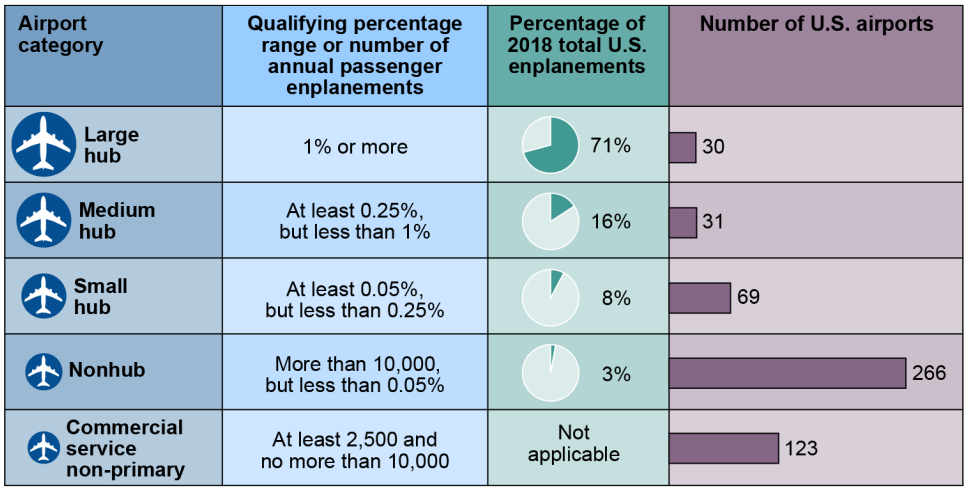
[13]Airline Deregulation Act of 1978, Pub. L. No. 95–504, 92 Stat. 1705.

experienced a period of sustained profitability from 2010 to 2019 based in part on the strength of the overall economy, consolidation among airlines, and industry's greater ability to align supply with levels of demand.

Airports

The United States has more than 19,000 airports, which vary substantially in size and the type of aviation services they support. Roughly 3,300 are public airports designated by FAA as part of the national airport system,[14] which consists of two categories of airports: (1) commercial service, which are publicly owned, have scheduled service, and board at least 2,500 passengers per year, and (2) general aviation and reliever airports, which have either no scheduled service or fewer than 2,500 passengers per year.[15] Federal law divides commercial service airports into various sub-categories, based on the number of passenger boardings (enplanements), ranging from large hub airports to commercial service non-primary airports (see fig. 1).

Figure 1: Commercial Airport Categories for U.S. Airports



Source: GAO analysis of Federal Aviation Administration (FAA) data. | GAO-22-104429

[14]The 3,300 airports designated by FAA as part of the national airport system are eligible for federal assistance for airport capital projects.

[15]According to FAA's National Plan of Integrated Airport Systems, 2021-2025, there are 2,535 general aviation airports and 250 reliever airports, which are designated by FAA to relieve congestion at nearby commercial service airports and to provide improved general aviation access to the overall community.

Data table for Figure 1: Commercial Airport Categories for U.S. Airports

Airport category	Qualifying percentage range or number of annual passenger enplanements	Percentage of 2018 total U.S. enplanements	Number of U.S. airports
Large hub	1% or more	71	30
Medium hub	At least 0.25%, but less than 1%	16	31
Small hub	At least 0.05%, but less than 0.25%	8	69
Nonhub	More than 10,000, but less than 0.05%	3	266
Commercial service non-primary	At least 2,500 and no more than 10,000	Not applicable	123

Source: GAO analysis of FAA data. | GAO-22-104429

Note: Primary commercial service airports are grouped into four hub categories. 49 U.S.C. §§ 47102(11), (13), (14), (25).

Commercial service airports collect the bulk of their revenues from two general groups of users: aeronautical users, such as passenger airlines, and non-aeronautical concessionaires, including car rental agencies, parking lots, restaurants, gift shops, and other small vendors. The airports provide these users with a wide range of facilities and services for which they assess fees, rents, or other charges.

Other sectors within the aviation and aerospace industries include:

- **Cargo airlines:** This sector includes airlines that operate aircraft configured specifically for carrying cargo. Compared to passenger aircraft that carry some belly cargo, dedicated cargo aircraft can carry more varied types of cargo, such as items that are large or unusually shaped, hazardous material, and livestock and other animals.
- **General aviation:** According to FAA, “general aviation” describes a diverse range of aviation activities and includes all segments of the aviation industry except commercial aviation and the military.[16] General aviation activities include training of new pilots and pilots interested in additional ratings or certification, sightseeing, movement of large heavy loads by helicopter, flying for personal or

[16]FAA, *FAA Aerospace Forecasts, Fiscal Years 2003-2014*.

business/corporate reasons, and emergency medical services. General aviation aircraft range from the one-seat single-engine piston aircraft to the long-range corporate jet, and also include gliders and amateur-built aircraft.

- **Manufacturers:** Airlines purchase commercial aircraft, jet engines, components, and other systems for the global aviation and aerospace industry from an array of manufacturers and related suppliers.
- **Repair station operators:** Three basic types of organizations perform aircraft maintenance for U.S. airlines: (1) airlines' in-house maintenance facilities; (2) original equipment manufacturers (OEMs) that offer maintenance capabilities for the aircraft parts they manufacture; and (3) independent repair stations (i.e., not owned or affiliated in whole or part by airlines or OEMs). Aircraft maintenance services include line maintenance, airframe heavy maintenance, engine repair and overhaul, and component maintenance.[17]
- **Uncrewed aircraft systems:** Uncrewed aircraft systems (UAS), or drones, have the potential to provide significant social and economic benefits in the United States, including by delivering packages, helping to fight fires, and distributing medical supplies at hospitals, as well as through military uses, such as intelligence, surveillance, and reconnaissance.[18]
- **Commercial space transportation:** Space transportation is the movement of objects, such as satellites and vehicles carrying cargo, scientific payloads, or passengers, to or from space. In the United States, commercial space transportation is carried out by private

[17]Line maintenance entails light, regular maintenance checks carried out to ensure that an aircraft is fit for flight. Airframe heavy maintenance involves regularly scheduled inspection, maintenance, preventive maintenance, and alteration that will take aircraft out of service for a pre-determined time at specified intervals. Engine repair and overhaul includes disassembling, inspecting, repairing, or replacing engine parts, followed by reassembling and testing. Component maintenance is the repair and overhaul of components that provide the basic functionality for flight. For more information, see GAO, *Aviation Safety: FAA's Risk-Based Oversight for Repair Stations Could Benefit from Additional Airline Data and Performance Metrics,* GAO-16-679 (Washington, D.C.: July 28, 2016).

[18]We did not include UAS in the scope of our audit work. In ongoing work, we are examining related issues including, among others, the status of FAA's efforts to integrate UAS into the National Airspace System, federal actions to address the malicious use of UAS in the airport environment, and workforce considerations for the use of UAS in transporting passengers and cargo, or Advanced Air Mobility.

companies using orbital and suborbital launch vehicles, which they own and operate.

Federal Assistance to the Aviation Industry during the COVID-19 Pandemic

In response to the public health and economic crises, COVID-19 relief laws have provided more than $100 billion in assistance for aviation businesses and airports since March 2020, and depending on the program, required recipients to temporarily maintain employment levels or refrain from conducting involuntary furloughs, among other requirements.[19] This assistance has included:

- Up to $63 billion in financial assistance to be used exclusively for the continuation of payment of employee wages, salaries, and benefits for eligible applicants including passenger airlines, cargo airlines, and certain aviation contractors;
- Up to $29 billion for loans and loan guarantees to provide liquidity to passenger airlines, cargo airlines, repair stations, and ticket agents;[20]
- $20 billion in airport grants to support U.S. airports of all sizes and certain tenants experiencing severe economic disruption caused by the COVID-19 pandemic;[21]

[19]GAO, *COVID-19: Opportunities to Improve Federal Response and Recover Efforts*, GAO-20-625 (Washington, D.C.: June 25, 2020). Conditions of the three financial assistance programs include prohibitions against involuntary layoffs or furloughs. Some airlines took action to offer early retirement. In addition, through attrition and hiring freezes, airlines were able to reduce headcount. As authorized by the CARES Act and the Consolidated Appropriations Act, 2021, DOT required scheduled passenger airlines receiving financial assistance to maintain minimum scheduled passenger service to points in the United States served prior to the pandemic, with some exceptions. Pub. L. No. 116-136, §§ 4005, 4114(b), 134 Stat. at 477, 499; Pub. L. No. 116-260, § 407, 134 Stat. at 2058-59.

[20]CARES Act, § 4003, 134 Stat. at 470. Section 4003 also included up to $17 billion for businesses critical to maintaining national security.

[21]Under the Consolidated Appropriations Act, 2021 and the American Rescue Plan Act of 2021, certain amounts were made available to provide relief from rent and minimum annual guarantees to airport concessions. 134 Stat. at 1939-40; § 7102, 135 Stat. at 96-98. The CARES Act gives the FAA the authority to retain up to 0.1 percent of the $10 billion (equaling up to $10 million) provided for Grants-in-Aid for Airports to fund the award and oversight by FAA of grants made under the CARES Act. Pub. L. No. 116-136, 134 Stat. at 596-597.

- $3 billion to establish an Aviation Manufacturing Jobs Protection program to provide payroll support payments to eligible businesses exclusively for the continuation of employee wages, salaries, and benefits, and to facilitate the retention, rehire, or recall of employees of the employer;[22] and
- A suspension of aviation excise taxes on air transport of people, cargo, and aviation fuel through calendar year 2020.[23]

The CARES Act provided other assistance for which entities beyond the aviation industry had eligibility, including the Paycheck Protection Program, Main Street Lending Program, and various employer and business tax provisions.[24]

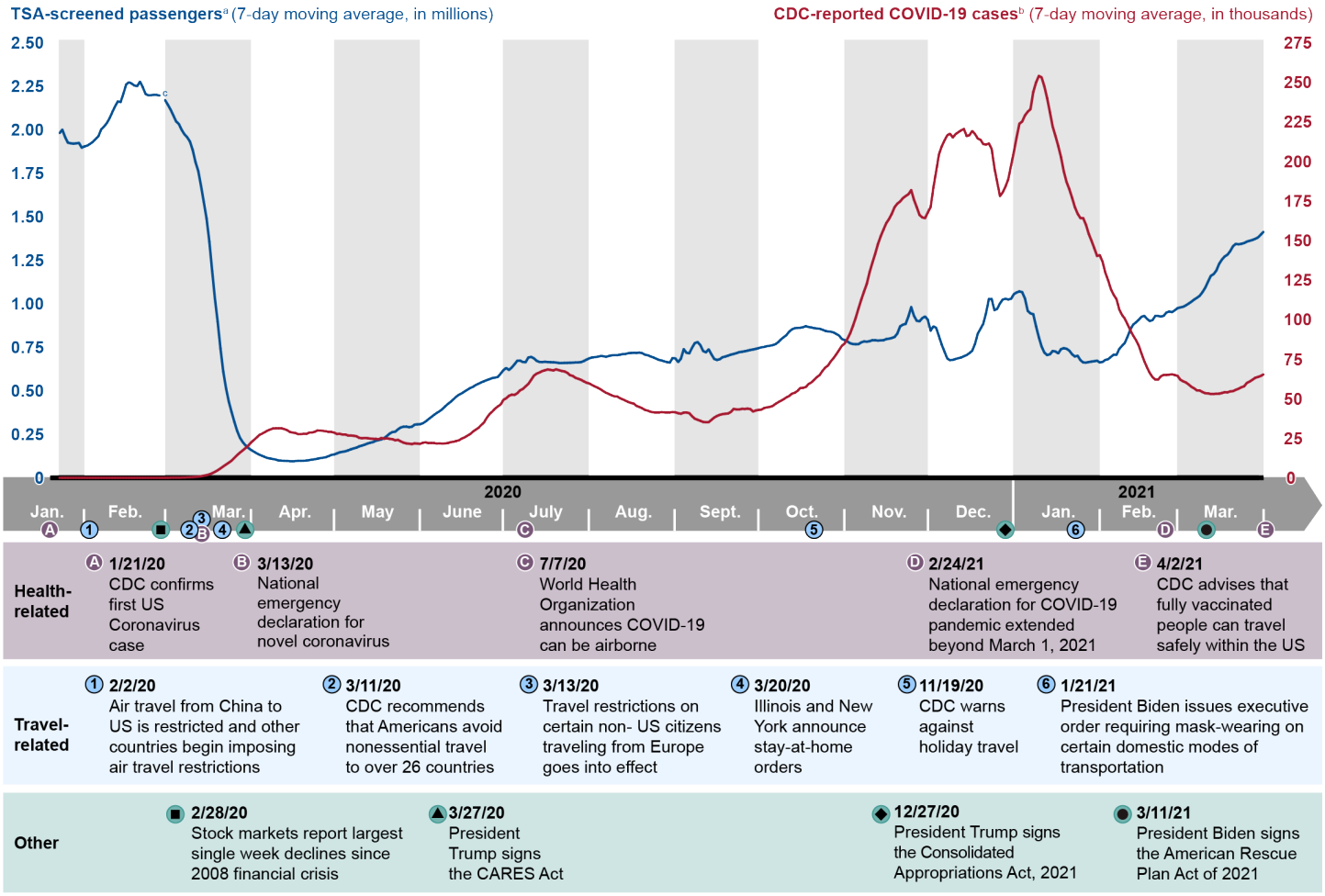
Figure 2 illustrates key trends and events in aviation, public health, and federal assistance during the COVID-19 pandemic in relation to airport traffic and reported COVID-19 infections.

[22]Under the American Rescue Plan Act of 2021, DOT may use up to 1 percent of the funds appropriated ($30 million) for implementation costs and administrative expenses. Pub. L. No. 117-2 § 7202(a), 135 Stat. at 103.

[23]In October 2020, Congress appropriated $14 billion from the General Fund to the Airport and Airway Trust Fund, the income of which had been affected by reduced revenues from air travel during the pandemic and the CARES Act's suspension of aviation excise taxes. Continuing Appropriations Act, 2021 and Other Extensions Act, Pub. L. No. 116-159, § 1205, 134 Stat. 709, 728. The Trust Fund funds, among other things, federal grants for airports, acquisition and maintenance for air traffic facilities and equipment, and research on issues related to aviation safety, mobility, and technologies. The Trust Fund receives income from sources including taxes on airline passenger ticket sales, segment fees, air cargo fees, and aviation fuel taxes paid by both commercial and general aviation aircraft.

[24]For a broader discussion of these COVID-19 relief provisions, see GAO, *COVID-19: Continued Attention Needed to Enhance Federal Preparedness, Response, Service Delivery, and Program Integrity*, GAO-21-551 (Washington, D.C.: July 19, 2021).

Figure 2: TSA-Screened Passengers, CDC-Reported COVID-19 Cases, and Selected Key Events during the COVID-19 Pandemic (January 2020 through March 2021)



Source: GAO analysis of Transportation Security Administration (TSA) information, Centers for Disease Control and Prevention (CDC) information, COVID-19 relief laws and Presidential documents, and Reuters news reports. | GAO-22-104429

Data table for Figure 2: TSA-Screened Passengers, CDC-Reported COVID-19 Cases, and Selected Key Events during the COVID-19 Pandemic (January 2020 through March 2021)

Date	TSA-screened passengers (7-day moving average, in millions)	CDC-reported COVID-19 cases (7-day moving average, in thousands)
1/23/2020	1.98021	0.005
1/24/2020	1.99968	0.005
1/25/2020	1.95768	0.005
1/26/2020	1.92525	0.006

Date	TSA-screened passengers (7-day moving average, in millions)	CDC-reported COVID-19 cases (7-day moving average, in thousands)
1/27/2020	1.92178	0.006
1/28/2020	1.91965	0.006
1/29/2020	1.92164	0.001
1/30/2020	1.9236	0.001
1/31/2020	1.89668	0.002
2/1/2020	1.90384	0.002
2/2/2020	1.90875	0.002
2/3/2020	1.91828	0.006
2/4/2020	1.93005	0.007
2/5/2020	1.94612	0.007
2/6/2020	1.96203	0.007
2/7/2020	2.00155	0.007
2/8/2020	2.0173	0.008
2/9/2020	2.03676	0.013
2/10/2020	2.06455	0.01
2/11/2020	2.09988	0.01
2/12/2020	2.1336	0.011
2/13/2020	2.16246	0.012
2/14/2020	2.15872	0.012
2/15/2020	2.20586	0.012
2/16/2020	2.25961	0.008
2/17/2020	2.27268	0.01
2/18/2020	2.26458	0.009
2/19/2020	2.25343	0.01
2/20/2020	2.25047	0.011
2/21/2020	2.27643	0.013
2/22/2020	2.24392	0.016
2/23/2020	2.20528	0.017
2/24/2020	2.19752	0.018
2/25/2020	2.19841	0.02
2/26/2020	2.20014	0.024
2/27/2020	2.19988	0.027
2/28/2020	2.19599	0.032
2/29/2020	0	0.033
3/1/2020	2.1706	0.043
3/2/2020	2.1444	0.051

Date	TSA-screened passengers (7-day moving average, in millions)	CDC-reported COVID-19 cases (7-day moving average, in thousands)
3/3/2020	2.11609	0.072
3/4/2020	2.08256	0.086
3/5/2020	2.04783	0.105
3/6/2020	2.03285	0.128
3/7/2020	1.99952	0.161
3/8/2020	1.97377	0.199
3/9/2020	1.95674	0.273
3/10/2020	1.93178	0.345
3/11/2020	1.88299	0.448
3/12/2020	1.81383	0.588
3/13/2020	1.7625	0.749
3/14/2020	1.67669	0.971
3/15/2020	1.58361	1.333
3/16/2020	1.48883	1.664
3/17/2020	1.35696	2.142
3/18/2020	1.19016	2.889
3/19/2020	1.02999	3.751
3/20/2020	0.896075	4.741
3/21/2020	0.743979	5.914
3/22/2020	0.611637	7.162
3/23/2020	0.515254	8.376
3/24/2020	0.438054	9.548
3/25/2020	0.378479	10.801
3/26/2020	0.322262	12.552
3/27/2020	0.270247	14.327
3/28/2020	0.231031	15.865
3/29/2020	0.205695	17.261
3/30/2020	0.186742	18.734
3/31/2020	0.171997	20.29
4/1/2020	0.160592	22.258
4/2/2020	0.150609	23.8
4/3/2020	0.14122	25.378
4/4/2020	0.132938	27.039
4/5/2020	0.126399	27.894
4/6/2020	0.119368	28.868
4/7/2020	0.113498	29.869

Date	TSA-screened passengers (7-day moving average, in millions)	CDC-reported COVID-19 cases (7-day moving average, in thousands)
4/8/2020	0.110651	30.557
4/9/2020	0.107681	31.215
4/10/2020	0.104159	31.242
4/11/2020	0.0996561	31.243
4/12/2020	0.098781	31.267
4/13/2020	0.0974101	30.794
4/14/2020	0.0968177	30.131
4/15/2020	0.0955313	29.019
4/16/2020	0.095161	28.544
4/17/2020	0.095674	28.307
4/18/2020	0.0977986	27.61
4/19/2020	0.0973929	27.656
4/20/2020	0.0981536	27.802
4/21/2020	0.0993227	27.745
4/22/2020	0.101686	28.537
4/23/2020	0.104126	28.614
4/24/2020	0.106586	29.111
4/25/2020	0.109942	29.95
4/26/2020	0.112872	29.931
4/27/2020	0.115451	29.628
4/28/2020	0.118403	29.388
4/29/2020	0.124556	29.048
4/30/2020	0.131427	29.03
5/1/2020	0.134256	28.491
5/2/2020	0.140167	27.721
5/3/2020	0.14643	27.786
5/4/2020	0.149242	27.358
5/5/2020	0.152211	27.371
5/6/2020	0.157378	26.74
5/7/2020	0.163646	26.705
5/8/2020	0.168692	26.556
5/9/2020	0.173058	26.274
5/10/2020	0.18048	25.264
5/11/2020	0.185137	25.007
5/12/2020	0.190317	25.168
5/13/2020	0.196612	25.048

Date	TSA-screened passengers (7-day moving average, in millions)	CDC-reported COVID-19 cases (7-day moving average, in thousands)
5/14/2020	0.201615	24.779
5/15/2020	0.20501	24.602
5/16/2020	0.21258	24.589
5/17/2020	0.216656	24.333
5/18/2020	0.220552	25.164
5/19/2020	0.228223	24.702
5/20/2020	0.240155	24.963
5/21/2020	0.254184	24.594
5/22/2020	0.262734	24.403
5/23/2020	0.264683	23.71
5/24/2020	0.278482	23.993
5/25/2020	0.289106	22.996
5/26/2020	0.293506	22.218
5/27/2020	0.293982	21.72
5/28/2020	0.290905	21.533
5/29/2020	0.293144	21.317
5/30/2020	0.305358	21.741
5/31/2020	0.307142	21.603
6/1/2020	0.307557	21.432
6/2/2020	0.313737	22.2
6/3/2020	0.323753	22.349
6/4/2020	0.336973	21.96
6/5/2020	0.348994	22.061
6/6/2020	0.36161	21.981
6/7/2020	0.372631	21.648
6/8/2020	0.382723	21.785
6/9/2020	0.394513	21.536
6/10/2020	0.410274	21.77
6/11/2020	0.424507	21.967
6/12/2020	0.436522	22.532
6/13/2020	0.451206	22.795
6/14/2020	0.46608	23.235
6/15/2020	0.477443	23.733
6/16/2020	0.48528	24.812
6/17/2020	0.495895	25.524
6/18/2020	0.505695	26.624

Date	TSA-screened passengers (7-day moving average, in millions)	CDC-reported COVID-19 cases (7-day moving average, in thousands)
6/19/2020	0.515697	27.556
6/20/2020	0.522327	29.187
6/21/2020	0.532757	30.381
6/22/2020	0.5404	31.536
6/23/2020	0.547971	33.326
6/24/2020	0.554701	34.974
6/25/2020	0.56114	37.922
6/26/2020	0.566737	40.268
6/27/2020	0.572931	41.875
6/28/2020	0.575459	43.722
6/29/2020	0.579549	45.108
6/30/2020	0.598362	46.286
7/1/2020	0.618524	49.3
7/2/2020	0.630811	50.239
7/3/2020	0.619433	51.819
7/4/2020	0.633478	52.528
7/5/2020	0.652095	52.388
7/6/2020	0.672339	53.416
7/7/2020	0.673194	55.286
7/8/2020	0.665321	56.129
7/9/2020	0.664198	57.768
7/10/2020	0.691285	59.355
7/11/2020	0.694489	61.9
7/12/2020	0.686264	64.568
7/13/2020	0.671765	65.836
7/14/2020	0.665592	66.544
7/15/2020	0.665094	67.442
7/16/2020	0.666416	67.971
7/17/2020	0.66504	68.453
7/18/2020	0.664022	68.161
7/19/2020	0.663643	67.874
7/20/2020	0.662236	68.522
7/21/2020	0.659617	68.03
7/22/2020	0.659424	67.518
7/23/2020	0.660052	67.208
7/24/2020	0.660391	66.403

Date	TSA-screened passengers (7-day moving average, in millions)	CDC-reported COVID-19 cases (7-day moving average, in thousands)
7/25/2020	0.660931	64.865
7/26/2020	0.661605	64.376
7/27/2020	0.66251	63.148
7/28/2020	0.662831	62.568
7/29/2020	0.664759	61.891
7/30/2020	0.670837	60.924
7/31/2020	0.67941	60.039
8/1/2020	0.68636	59.626
8/2/2020	0.691674	58.584
8/3/2020	0.692651	57.713
8/4/2020	0.695871	56.935
8/5/2020	0.699484	55.946
8/6/2020	0.698802	54.76
8/7/2020	0.695113	53.722
8/8/2020	0.699675	53.006
8/9/2020	0.703193	52.139
8/10/2020	0.705452	51.504
8/11/2020	0.70474	51.408
8/12/2020	0.707343	50.339
8/13/2020	0.710371	49.579
8/14/2020	0.711326	48.753
8/15/2020	0.715777	47.899
8/16/2020	0.717414	47.292
8/17/2020	0.718346	46.902
8/18/2020	0.71777	45.383
8/19/2020	0.719279	44.788
8/20/2020	0.716525	43.979
8/21/2020	0.707372	42.925
8/22/2020	0.704351	42.432
8/23/2020	0.697704	41.788
8/24/2020	0.691595	41.364
8/25/2020	0.684928	41.244
8/26/2020	0.677596	41.251
8/27/2020	0.67394	41.464
8/28/2020	0.66907	41.321
8/29/2020	0.664197	41.269

Date	TSA-screened passengers (7-day moving average, in millions)	CDC-reported COVID-19 cases (7-day moving average, in thousands)
8/30/2020	0.661967	41.281
8/31/2020	0.688823	41.564
9/1/2020	0.685398	41.347
9/2/2020	0.66498	40.818
9/3/2020	0.684812	40.495
9/4/2020	0.73866	41.206
9/5/2020	0.718224	41.246
9/6/2020	0.715145	40.85
9/7/2020	0.747164	38.933
9/8/2020	0.774022	37.344
9/9/2020	0.779564	36.662
9/10/2020	0.762043	36.006
9/11/2020	0.72814	35.288
9/12/2020	0.720863	35.106
9/13/2020	0.738038	35.179
9/14/2020	0.708645	36.614
9/15/2020	0.682689	38.078
9/16/2020	0.677106	39.073
9/17/2020	0.681349	39.803
9/18/2020	0.6929	40.232
9/19/2020	0.696453	40.475
9/20/2020	0.701899	40.636
9/21/2020	0.707667	41.613
9/22/2020	0.711575	43.527
9/23/2020	0.715987	43.196
9/24/2020	0.721925	43.187
9/25/2020	0.723942	43.556
9/26/2020	0.726909	43.494
9/27/2020	0.730491	43.699
9/28/2020	0.734457	43.435
9/29/2020	0.737164	41.89
9/30/2020	0.740781	42.573
10/1/2020	0.745008	42.912
10/2/2020	0.749416	43.086
10/3/2020	0.752032	44.09
10/4/2020	0.756014	44.498

Date	TSA-screened passengers (7-day moving average, in millions)	CDC-reported COVID-19 cases (7-day moving average, in thousands)
10/5/2020	0.758748	44.797
10/6/2020	0.761902	45.31
10/7/2020	0.766827	46.602
10/8/2020	0.778399	47.694
10/9/2020	0.794308	48.645
10/10/2020	0.80748	49.635
10/11/2020	0.819384	50.799
10/12/2020	0.839612	51.693
10/13/2020	0.852488	53.151
10/14/2020	0.859548	53.72
10/15/2020	0.861421	54.862
10/16/2020	0.862064	56.732
10/17/2020	0.86476	56.863
10/18/2020	0.871513	57.343
10/19/2020	0.866169	59.281
10/20/2020	0.863539	60.248
10/21/2020	0.86014	61.903
10/22/2020	0.857906	63.638
10/23/2020	0.855819	64.899
10/24/2020	0.85104	67.536
10/25/2020	0.844217	69.654
10/26/2020	0.841032	70.904
10/27/2020	0.839037	73.557
10/28/2020	0.835152	75.62
10/29/2020	0.826473	78.052
10/30/2020	0.817084	80.726
10/31/2020	0.79754	83.385
11/1/2020	0.790732	84.899
11/2/2020	0.783218	87.826
11/3/2020	0.772834	91.289
11/4/2020	0.768488	95.958
11/5/2020	0.767555	101.13
11/6/2020	0.767895	107.029
11/7/2020	0.778106	112.592
11/8/2020	0.783381	117.74
11/9/2020	0.782018	122.653

Date	TSA-screened passengers (7-day moving average, in millions)	CDC-reported COVID-19 cases (7-day moving average, in thousands)
11/10/2020	0.784968	129.944
11/11/2020	0.790411	135.859
11/12/2020	0.79035	141.448
11/13/2020	0.78842	147.683
11/14/2020	0.789478	152.619
11/15/2020	0.790232	156.824
11/16/2020	0.796883	160.885
11/17/2020	0.799029	163.517
11/18/2020	0.803101	166.853
11/19/2020	0.808908	170.995
11/20/2020	0.828659	173.256
11/21/2020	0.86966	174.61
11/22/2020	0.879609	176.736
11/23/2020	0.884494	178.049
11/24/2020	0.927436	179.192
11/25/2020	0.979983	181.759
11/26/2020	0.930493	175.669
11/27/2020	0.902002	171.043
11/28/2020	0.899182	166.104
11/29/2020	0.91749	164.545
11/30/2020	0.926713	164.105
12/1/2020	0.907883	167.667
12/2/2020	0.845225	171.1
12/3/2020	0.870532	183.476
12/4/2020	0.861039	193.757
12/5/2020	0.813153	204.352
12/6/2020	0.764731	209.454
12/7/2020	0.724965	213.157
12/8/2020	0.68514	216.481
12/9/2020	0.675428	217.466
12/10/2020	0.677751	215.04
12/11/2020	0.682542	217.215
12/12/2020	0.687249	218.413
12/13/2020	0.691232	219.597
12/14/2020	0.698218	220.437
12/15/2020	0.705434	215.895

Date	TSA-screened passengers (7-day moving average, in millions)	CDC-reported COVID-19 cases (7-day moving average, in thousands)
12/16/2020	0.716519	216.56
12/17/2020	0.729751	219.232
12/18/2020	0.769645	217.24
12/19/2020	0.828386	214.403
12/20/2020	0.856901	213.589
12/21/2020	0.885805	210.796
12/22/2020	0.948683	210.607
12/23/2020	1.02713	211.293
12/24/2020	1.02707	207.851
12/25/2020	0.962749	195.876
12/26/2020	0.970636	186.791
12/27/2020	1.00206	178.054
12/28/2020	1.02449	180.406
12/29/2020	1.02837	184.063
12/30/2020	1.02445	188.783
12/31/2020	1.02843	197.455
1/1/2021	1.05551	206.037
1/2/2021	1.06467	215.208
1/3/2021	1.07077	223.757
1/4/2021	1.06628	225.144
1/5/2021	1.03017	229.009
1/6/2021	0.959052	231.337
1/7/2021	0.944384	232.976
1/8/2021	0.939596	243.833
1/9/2021	0.870533	249.833
1/10/2021	0.807569	253.932
1/11/2021	0.754402	253.043
1/12/2021	0.719191	247.345
1/13/2021	0.705126	239.897
1/14/2021	0.709691	230.991
1/15/2021	0.728343	221.9
1/16/2021	0.725628	215.991
1/17/2021	0.714788	209.715
1/18/2021	0.739055	202.628
1/19/2021	0.74478	193.67
1/20/2021	0.741199	186.947

Date	TSA-screened passengers (7-day moving average, in millions)	CDC-reported COVID-19 cases (7-day moving average, in thousands)
1/21/2021	0.730526	182.37
1/22/2021	0.709382	176.912
1/23/2021	0.696966	171.034
1/24/2021	0.700889	166.881
1/25/2021	0.675698	164.125
1/26/2021	0.662661	164.046
1/27/2021	0.661889	159.909
1/28/2021	0.664972	154.113
1/29/2021	0.667781	149.743
1/30/2021	0.669775	145.069
1/31/2021	0.672764	140.224
2/1/2021	0.662376	140.681
2/2/2021	0.665862	136.391
2/3/2021	0.677531	129.511
2/4/2021	0.68146	124.751
2/5/2021	0.69488	119.197
2/6/2021	0.707517	115.574
2/7/2021	0.706888	112.92
2/8/2021	0.740573	106.391
2/9/2021	0.758328	102.911
2/10/2021	0.774955	100.55
2/11/2021	0.811591	96.945
2/12/2021	0.85199	93.17
2/13/2021	0.879811	89.906
2/14/2021	0.892928	87.08
2/15/2021	0.90763	83.653
2/16/2021	0.924945	78.569
2/17/2021	0.930433	73.825
2/18/2021	0.913334	69.757
2/19/2021	0.900196	66.201
2/20/2021	0.90613	63.579
2/21/2021	0.930276	62.088
2/22/2021	0.929646	62.041
2/23/2021	0.926203	64.15
2/24/2021	0.930318	64.999
2/25/2021	0.949793	65.014

Date	TSA-screened passengers (7-day moving average, in millions)	CDC-reported COVID-19 cases (7-day moving average, in thousands)
2/26/2021	0.955064	65.15
2/27/2021	0.951499	65.392
2/28/2021	0.962242	64.946
3/1/2021	0.974587	64.412
3/2/2021	0.978885	62.005
3/3/2021	0.982413	60.997
3/4/2021	0.990468	60.259
3/5/2021	1.00081	59.005
3/6/2021	1.01154	57.496
3/7/2021	1.02409	56.518
3/8/2021	1.03404	55.211
3/9/2021	1.0456	55.166
3/10/2021	1.06664	54.201
3/11/2021	1.09227	53.44
3/12/2021	1.1267	53.35
3/13/2021	1.16028	52.964
3/14/2021	1.16981	52.986
3/15/2021	1.19096	53.12
3/16/2021	1.22908	53.154
3/17/2021	1.2537	53.58
3/18/2021	1.27173	54.094
3/19/2021	1.28145	54.006
3/20/2021	1.30228	54.594
3/21/2021	1.33054	54.759
3/22/2021	1.34382	55.586
3/23/2021	1.34152	56.275
3/24/2021	1.34415	57.212
3/25/2021	1.34867	57.804
3/26/2021	1.35686	59.979
3/27/2021	1.36185	60.806
3/28/2021	1.36629	61.96
3/29/2021	1.37285	63.184
3/30/2021	1.38058	63.726
3/31/2021	1.39674	64.353
4/1/2021	1.41353	65.371

Notes:

[a]TSA screened passenger data include TSA, airport, and airline employees transiting checkpoints and therefore represents slightly more than actual passenger traffic. The 7-day moving averages were calculated as the (current day + 6 preceding days)/7, where data were reported. The TSA data were accessed on August 31, 2021.

[b]Reported COVID-19 cases include confirmed and probable cases. The 7-day moving averages were calculated as the (current day + 6 preceding days)/7, where data were reported. The CDC data were accessed on August 27, 2021.

[c]The TSA screened passenger data on February 29, 2020 was not reported and therefore not included in the 7-day moving average.

Source: GAO analysis of Transportation Security Administration (TSA) information, Centers for Disease Control and Prevention (CDC) information, COVID-19 relief laws and Presidential Proclamations, and Reuters news reports. | GAO-22-104429

The COVID-19 Pandemic Had Disparate Effects on Selected Aviation and Aerospace Sectors in 2020

The COVID-19 pandemic had disparate effects on selected aviation and aerospace sectors in 2020, most severely affecting the sectors that are dependent on commercial passenger activity. The dramatic drop in demand for passenger air travel had a cascading effect across commercial aviation sectors, including passenger airlines, airports, aviation manufacturers, and repair station operators. However, other aviation and aerospace sectors that are less reliant on passenger activity, such as cargo airlines, business aviation, and the commercial space transportation industry, experienced less of a reduction—and in some cases an increase—in demand for their services.

The Dramatic Drop in Demand for Passenger Air Travel in 2020 Had Cascading Effects across Commercial Aviation Sectors

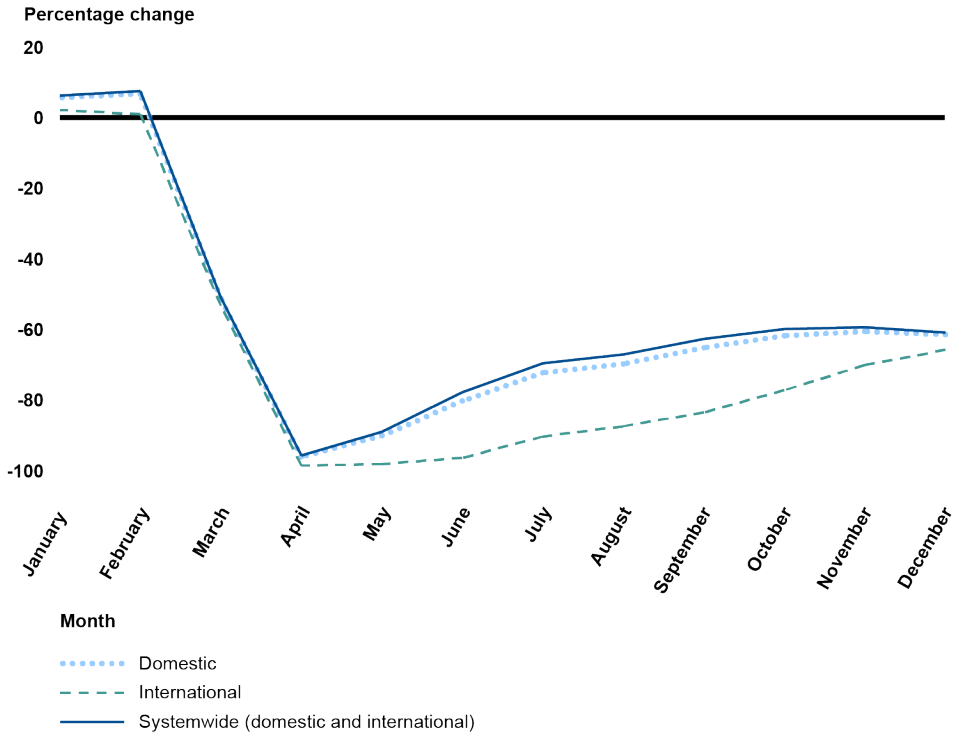
Passenger Airlines Experienced Unprecedented Reduction in Demand for Air Travel

U.S. passenger airlines experienced an unprecedented reduction in the demand for air travel in 2020 as a result of the COVID-19 pandemic. According to Bureau of Transportation Statistics (BTS) data, annual airline passenger traffic was down 60 percent system-wide in 2020 compared to annual traffic levels in 2019. Passenger traffic reached the lowest levels in April 2020, when traffic fell to 3 million passengers, a 96 percent decrease compared to the previous April. As the industry group

Airlines for America (A4A) testified to Congress, such low traffic levels had not been seen since the 1950s.[25]

Passenger traffic has slowly returned since the trough in demand in April 2020, with the return of domestic traffic outpacing the return of international traffic (see figure 3). Annual international air traffic was over 70 percent lower in 2020 compared to 2019 and accounted for 9 percent of all U.S. passenger air traffic, compared to 12 percent in 2019.

Figure 3: U.S. Airline Passenger Traffic, Percentage Change 2019 versus 2020, by Type



Source: GAO analysis of Department of Transportation Bureau of Transportation Statistics data. | GAO-22-104429

[25]*Prepare for Takeoff: America's Safe Return to Air Travel, Hearing on SR-253, Before the U.S. Senate Committee on Commerce, Science, and Transportation Subcommittee on Aviation Safety, Operations, and Innovation*, 117th Cong. (2021) (statement of Nick Calio, President and CEO, Airlines for America).

Data table for Figure 3: U.S. Airline Passenger Traffic, Percentage Change 2019 versus 2020, by Type

Month	Domestic	International	Systemwide (Domestic and International)
January	6.2	2.1	5.6
February	7.5	0.9	6.7
March	-51	-53.3	-51.3
April	-95.7	-98.6	-96.1
May	-89	-98.1	-90.1
June	-77.8	-96.4	-80.3
July	-69.6	-90.3	-72.3
August	-67.1	-87.4	-69.8
September	-62.7	-83.5	-65.2
October	-59.9	-77.2	-61.8
November	-59.4	-70.1	-60.6
December	-60.9	-65.8	-61.5

Source: GAO analysis of Department of Transportation Bureau of Transportation Statistics data. | GAO-22-104429

In addition, business passengers have been slower to return than leisure passengers. This slower return is in part due to the increased use of virtual meeting technology, according to the consulting firm McKinsey & Company,[26] as well as potential liability concerns. According to data collected by the Airlines Reporting Corporation (ARC), the sale of corporate tickets reached its lowest point in April 2020 when sales were down over 96 percent from the prior year. ARC data further indicates that sales of corporate tickets remained low throughout 2020, continuing to be approximately 80 percent lower than pre-pandemic levels as of late December 2020.

This sharp decline in demand affected airlines' revenues, but the extent of that effect varied across airlines based on their business models.

- **Network airlines:** The long period of reduced business and international passenger traffic has particularly affected the revenues of network airlines, which typically generate a large portion of their

[26]McKinsey & Company, *For Corporate travel, a long recovery ahead* (August 2020).

revenues from such travelers. According to the credit rating agency Moody's, large U.S. network airlines generate at least one third of their revenue from business travelers, despite the fact that business travelers make up only about 12 percent of global passengers.[27] Based on BTS data, Delta Air Lines, American Airlines, and United Airlines—the top three major U.S. network airlines based on 2019 operating revenues—experienced a 94 percent decline in passenger revenues in the second quarter of 2020 compared to the second quarter of 2019.[28] By the fourth quarter of 2020, the three network airlines' passenger revenues remained down 76 percent. While the decline in revenues was largely due to the decline in passengers, fare reductions also had an effect. For example, selected network airlines reduced their gross average fare by 19 percent in 2020 compared to 2019, in part to attract passenger traffic.[29] For the majority of the year, these airlines were experiencing negative cash flow or "cash burn," whereby they needed to use cash reserves to fund their daily operations. For example, United Airlines reported that it spent $40 million more per day than it earned in revenue in the second quarter of 2020.

- **Low-cost airlines:** Low-cost airlines' business models rely largely on customers flying domestically for leisure travel at generally lower airfares than those charged by network airlines. These airlines experienced a faster return of their passenger traffic, and in turn their revenues, than network airlines. For example, according to BTS data, six selected low-cost airlines experienced an 87 percent decline in passenger revenues in the second quarter of 2020 compared to 2019.[30] By the fourth quarter of 2020, the low-cost airlines' passenger revenues were down only 67 percent compared to the same quarter in the prior year. Like network airlines, low-cost airlines' revenues were also affected by their fare reductions. Selected low-cost airlines reduced their average gross fare by 21 percent in 2020 compared to 2019. Low-cost airlines also experienced negative cash flow, but

[27]Moody's Investors Service, *Business Travel Faces Higher Substitution Risk post-COVID, but Airlines will Adapt* (Mar. 24, 2021).

[28]Passenger revenue is revenue received by the airline from the carriage of passengers in scheduled operations.

[29]Gross fare was calculated using U.S. DOT Origin & Destination summary data, which sources from a 10% sample of all U.S. airline tickets.

[30]Based on BTS 2019 airline rankings of the top 21 airlines by operating revenue, we included Allegiant Air, Frontier Airlines, JetBlue Airways, Southwest Airlines, Spirit Airlines, and Sun Country Airlines in our analysis of low-cost airlines.

recovered faster than the network airlines. For example, Spirit Airlines reported that it spent approximately $9.5 million more per day than it earned in revenue in April 2020, but in the fourth quarter—October through December—of 2020 it reduced that daily average negative cash flow to $1.8 million.

- **Regional airlines:** Regional airlines, whose business models rely on contracts with their network airline partners, experienced mixed impacts from the pandemic. Four regional airlines ceased operation in 2020; however, certain remaining regional airlines were profitable in 2020 due to the nature of their existing contracts with their network airline partners. For example, representatives from one regional airline we interviewed credited their profitability in 2020 in part to the fact that their business is based primarily on what are called "capacity purchase agreements." Under these agreements, network airline partners contract with regional airlines to provide service on regional routes, and in exchange, the network airlines generally pay a variety of the regional airlines' costs, including, for example, a guaranteed monthly fee and payment for the regional airlines' hours in service and certain other flight costs such as fuel. Additionally, representatives from another regional airline told us that in some cases, they flew flights on routes on which their network airline partners previously flew larger jets, as their network airline partners responded to decreased demand by flying smaller, less expensive regional aircraft on certain routes instead of mostly empty, larger jets.

Airport Revenues Declined as a Result of Reduced Demand for Air Travel

U.S. airports experienced a significant reduction in passenger traffic as a result of the pandemic, although the extent of this reduction varied depending on the type of travelers an airport typically serves. Large airports that serve business and international travelers—such as JFK International Airport and Boston Logan International Airport—experienced a greater and more sustained decline in passenger traffic compared to airports that are in leisure destinations. For example, according to data from A4A, traveler throughput in New York and Massachusetts was down more than 75 percent in November 2020 compared to November 2019, while Florida and Arizona—which are popular U.S. leisure travel destinations—experienced declines of approximately 50 percent over the same period.

Based on our interviews with large and medium hub airport representatives and our survey of smaller airports, we found that airports

of all sizes experienced a decline in both aeronautical[31] and non-aeronautical operating revenues as a result of the COVID-19 pandemic.[32] Specifically, representatives from the large and medium hub airports we interviewed reported that their revenue losses were tied to decreases in the various forms of passenger-driven operating revenues they collect. For example, representatives at one large hub airport told us that relative to 2019 levels, aeronautical operating revenue collected from landing fees paid by airlines at their airport was down approximately 60 percent in April 2020 and down 30 percent in September 2020. Furthermore, representatives from some of these airports told us that passenger-driven sources of non-aeronautical revenues such as concessions and parking had dropped 35 percent or more in 2020 compared to 2019.

Similarly, based on the smaller airports we surveyed, we estimate that small hub and non-hub airports experienced greater percentage declines in revenues than non-primary commercial service or general aviation and reliever airports,[33] a reflection of the small- and non-hub airports' heavier

[31]The estimated percentage (lower bound, upper bound) of airports reporting a decline in aeronautical revenue between September 2019 and September 2020 was 85 (73, 93) percent for small hub airports, 92 (87, 96) percent for non-hub airports, 69 (56, 80) percent for non-primary commercial service airports, and 54 (50, 58) percent for general aviation and reliever airports. The margins of error between the estimates for the small hub and non-primary commercial service airports and the upper or lower bounds were greater than 10 percentage points. These estimates should be interpreted with caution.

[32]Airports generate both aeronautical revenues and non-aeronautical revenues. Aeronautical revenues are derived from the operation and landing of aircraft, passengers, or freight. As discussed later, airports assess fees on airlines for the use of the airport based on negotiated agreements. These agreements vary in whether the airline or the airport bears the risk if the fees paid by airlines and others do not fully cover the airport's costs. Non-aeronautical revenues are derived from sources unrelated to the operation and landing of aircraft, passengers, or freight, such as terminal concessions and parking fees.

[33]The estimated percentage (lower bound, upper bound) of airports reporting a decline in aeronautical revenue of more than 50 percent between September 2019 and September 2020 was 30 (19, 44) percent for small hub airports, 38 (36, 41) percent for non-hub airports, 15 (7, 26) percent for non-primary commercial service airports, and 12 (9, 15) percent for general aviation and reliever airports. The margins of error between the estimates for the small hub and non-primary commercial service airports and the upper or lower bounds were greater than 10 percentage points. These estimates should be interpreted with caution. The estimated percentage (lower bound, upper bound) of airports reporting a decline in non-aeronautical revenue of more than 50 percent between September 2019 and September 2020 was 47 (44, 51) percent for small hub airports, 32 (30, 34) percent for non-hub airports, 13 (6, 24) percent for non-primary commercial service airports, and 7 (5, 9) percent for general aviation and reliever airports. The margins of error between the estimates for the non-primary commercial service airports and the upper or lower bounds were greater than 10 percentage points. These estimates should be interpreted with caution.

reliance on scheduled commercial passenger service. For example, based on our survey, we estimate that about 60 percent of all smaller airports had a decrease in aeronautical revenues in September 2020 compared to September 2019, and among those airports, about a quarter experienced a decrease in revenues of more than 50 percent. Additionally, we estimate that about half of small hub and about one-third of non-hub airports experienced a decrease in non-aeronautical revenues of more than 50 percent. At the same time, however, about 60 percent of general aviation and reliever airports and about 40 percent of non-primary commercial service airports did not see a change in their non-aeronautical revenues. For the full results of our survey of smaller airports, see appendix II.

Declining Passenger Travel Led to Reduced Demand for Commercial Airplanes, Engines, and Aircraft Maintenance Services

In response to reduced passenger demand, airlines parked or retired a substantial portion of their aircraft fleet (as we discuss later in this report), which in turn reduced demand for new commercial airplanes, engines, and spare parts in the near term. According to representatives we interviewed from two aviation manufacturers and one supplier, and financial statements publicly reported by these businesses, they experienced a decline in revenues as a result of delayed delivery or deferred orders from airlines and other manufacturers. For example, one large engine manufacturer publicly reported that its aviation segment orders were down $15.1 billion—41 percent—in 2020 compared to 2019. It attributed the decrease primarily to lower commercial equipment and service orders as airline customers slowed or deferred new engine orders. For these manufacturers, the effects of the pandemic were preceded by the financial impact of the 737 MAX grounding in 2019, which affected not only Boeing but companies in the supply chain that produced components for the 737 MAX.[34]

Airline decisions in response to passenger demand also affected businesses that provide aircraft maintenance services. Representatives from three repair station operators told us that airline decisions to reduce

[34]On March 13, 2019, FAA issued an emergency order prohibiting the operation of Boeing 737 MAX series aircraft by U.S. certificated operators in response to the crashes of Lion Air Flight 610 in Indonesia on October 28, 2018 and Ethiopian Airlines Flight 302 on March 10, 2019. FAA rescinded the emergency order and cleared the MAX to fly again on November 18, 2020.

capacity by flying less frequently reduced demand for maintenance services in the near term. For example, representatives from one repair station operator reported that demand from their commercial airline customers declined by 70-80 percent. Additionally, according to a June 2020 survey by the Aeronautical Repair Station Association, 87 percent of member repair station respondents reported revenue declines in January–May 2020, with an average decline of about 46 percent.[35]

Other Aviation and Aerospace Sectors Experienced Increased Demand or Suffered a Less Severe Reduction in Demand in 2020

Cargo Airlines

As a result of the larger number of people staying home during the pandemic and the growth in e-commerce, domestic cargo airlines experienced an increased demand for service. According to BTS data, 2020 was a record year in the amount of cargo carried by airlines. In 2020, the top fifteen U.S. airlines based on tons of cargo transported in 2020 carried 1.46 million more tons of cargo than in 2019, an increase of 10.7 percent year-over-year.[36] These airlines experienced an average 5.5 percent increase in total operating revenues in 2020 compared to 2019.

Representatives from the large cargo airline we spoke with told us that in the early stage of the pandemic, neither their company nor the broader U.S. cargo aviation system had the capacity to meet the quick increase in demand for cargo services; however, the industry was able to accommodate this increase in demand relatively quickly. The decrease in passenger airline flights reduced cargo capacity early in the pandemic because passenger flights normally carry some cargo in the belly of their aircraft. However, capacity constraints were eased as passenger airlines' traffic picked up and as some cargo was accommodated on empty passenger planes. Additionally, representatives from the large cargo airline we spoke with told us they also met the increased demand for cargo transport in part by ramping up their hiring of 100,000 winter-

[35]Aeronautical Repair Station Association, "Pandemic Impacts on Aviation Markets: Employment and Revenue Losses Reported by U.S. Maintenance Companies, January 1, 2020 to June 1, 2020," July 28, 2020.

[36]The largest fifteen cargo airlines were based on total freight and mail transported in 2020. These airlines generated at least 30 percent of their operating revenues from freight and mail transport.

season employees earlier in the year than usual and maintaining those workforce levels through the winter.

Representatives from the two smaller charter cargo airlines we spoke with told us they experienced uncertainty and volatility in their operations in 2020. Representatives told us that they initially experienced large decreases in demand early in 2020 as the markets they served shut down, starting with China in January and February, followed by Europe and then the U.S. in March. As a result, representatives from both airlines told us that in the first quarter of 2020, they were losing money and under financial stress. However, they told us they experienced a return in demand as the markets they service reopened, starting in mid-to-late spring 2020.

Business Aviation

Similar to other aviation sectors, business aviation— the use of smaller, general aviation aircraft primarily for business purposes—experienced a steep decline in activity early in the pandemic; however, demand began to recover for this sector in the second half of 2020, much faster than for passenger airlines. For example, according to FAA data, domestic and international business jet operations in April 2020 were nearly 75 percent below 2019 levels, but by June 2020 had recovered to levels 24 percent below those in June 2019, and by December 2020 were only about 12 percent lower than the prior year's level of activity.[37] According to a December 2020 report from S&P Global Ratings, demand for business aviation had rebounded in part due to increased demand from corporate executives and individuals able to pay for alternatives to commercial scheduled passenger service during the pandemic.[38]

Representatives from the two business jet manufacturers we interviewed reported decreased demand in spring 2020 as a result of the pandemic, but told us that demand improved in the latter half of the year. They attributed lower demand in part to customer uncertainty concerning the timing of economic recovery and managing supply chain disruptions. In particular, both manufacturers told us that domestic and global travel restrictions presented challenges in completing aircraft deliveries; however, they told us it was helpful that customers generally delayed or

[37]Federal Aviation Administration, *Business Jet Report: January 2021*.

[38]S&P Global Ratings, *Industry Top Trends 2021: Aerospace and Defense* (Dec.10, 2020).

deferred aircraft orders rather than cancel them altogether. Both manufacturers experienced increased demand for their products in the third and fourth quarters of 2020 compared to the first half of the year. Officials from one manufacturer we spoke with attributed this improvement to a combination of increased optimism around vaccine availability and distribution, a better understanding of how the pandemic may progress, and general optimism about the direction of the economy. According to shipment data for U.S. manufactured aircraft from the General Aviation Manufacturers Association, whose membership includes business jet manufacturers, deliveries of business jets increased in the third and fourth quarters of 2020 versus the first half of the year, but overall were 12 percent lower in 2020 than in 2019.

Commercial Space Transportation

Representatives we spoke with from the commercial space transportation industry told us that, to date, the COVID-19 pandemic has had varied effects on the industry. Some sectors of commercial space transportation experienced growth—namely the commercial space launch sector that, while largely driven by one launch provider, experienced a 50 percent increase in the number of FAA-licensed commercial launches from calendar year 2019 to 2020.[39] Representatives from an industry association and an analytics and engineering firm told us that the demand for some sectors of commercial space dropped—such as demand for satellite services to commercial airlines and cruise ships. However, representatives from an industry association explained that because commercial space companies generally have longer-range business models than traditional aviation, a decrease in demand does not immediately affect the sustainability of operations.

Aviation and Aerospace Stakeholders Responded to the Pandemic's Effects by Taking

[39]We have previously reported on the growth and evolution of the commercial space transportation industry and FAA's efforts to oversee it. See, for example, GAO, *Commercial Space Transportation: FAA Continues to Update Regulations and Faces Challenges to Overseeing an Evolving Industry,* GAO-21-105268 (Washington, D.C.: June 16, 2021); *Commercial Space Transportation: FAA Should Examine a Range of Options to Support U.S. Launch Infrastructure*, GAO-21-154 (Washington, D.C.: Dec. 22, 2020); and *Commercial Space Transportation: Improvements to FAA's Workforce Planning Needed to Prepare for the Industry's Anticipated Growth,* GAO-19-437 (Washington, D.C.: May 23, 2019).

a Variety of Actions to Maintain Business Viability

In response to the many effects of the COVID-19 pandemic, aviation stakeholders reported that throughout 2020, they quickly implemented measures to mitigate financial losses and position themselves to maintain business viability until demand recovers.[40] These actions included managing costs—which often included reducing costs; using federal assistance provided through COVID-19 relief legislation; raising funds in the private market; and taking actions to mitigate the spread of COVID-19 among employees and customers.

Aviation and Aerospace Stakeholders Took Several Actions to Manage Labor and Other Operating Costs, and Reduced Capital Investments

Labor Costs

Passenger airlines took several actions to manage labor costs throughout 2020, such as offering employees voluntary unpaid leave or separation and early retirement programs, freezing non-essential hiring, and implementing involuntary furloughs within the limits of the COVID-19 relief laws.[41] For example, Delta Air Lines reported in public SEC financial reports that 50,000 employees took voluntary unpaid leaves of absence and approximately 18,000 employees participated in the airline's early retirement and voluntary separation programs in 2020. American Airlines reported reducing its management and support staff team by approximately 5,100 positions (30 percent) in 2020 and that more than 20,000 of its employees opted for early retirement or long-term partially paid leave as of December 2020. Furthermore, American Airlines, Delta Air Lines, and United Airlines all reported freezing non-essential hiring.

[40]We excluded from this discussion commercial space transportation for which the pandemic had less deleterious effects.

[41]Aviation stakeholders across sectors reduced labor costs. However, as discussed above, airlines and airports accepting federal assistance from the CARES Act and subsequent COVID-19 relief laws were limited in their ability to reduce employment levels or conduct involuntary furloughs.

Airports took similar actions to manage their labor costs throughout 2020, although only a small percentage of workers at U.S. airports are employed by the airport.[42] Airports that accepted grant funds from the federal COVID-19 relief programs were also limited in their ability to reduce employment levels or conduct involuntary furloughs.[43] Representatives from nearly all of the eleven large and medium hub airports we spoke with cited managing costs through suspending or slowing down hiring. For example, representatives at one large hub airport operated by a municipal government told us their airport was affected by a hiring slow-down that limited new hiring to only critical positions. In addition, representatives from four airports we spoke with told us they offered voluntary early retirement programs. Representatives from one of the eleven airports we spoke with told us they went through a reduction in force limited to 26 union and non-union employees, which reduced the airport's payroll by about 5 percent. Based on our survey of smaller airports, we estimate that about 5 percent of smaller airports implemented staff layoffs and about 20 percent of smaller airports decreased staff hours to reduce operating costs at their airports.

Representatives from two manufacturers and two repair station operators we interviewed also reported that they reduced their workforces in 2020 through reductions to employees' hours, layoffs, furloughs, and in some cases, closing facilities. For example, representatives from one repair station operator that did not receive COVID-19 relief funding told us they reduced their staff by 50 percent in 2020. Similarly, one large manufacturer of airplane engines permanently reduced its global workforce of 52,000 employees by approximately 25 percent in 2020, and representatives from a business jet manufacturer told us that more than

[42]Airport direct hires are a small number of people who work at an airport. Many people working in airports are employees of private companies, such as airlines and airport tenants. For example, gate agents are hired by airlines and concessionaire employees are hired directly by concessionaires.

[43]Certain airport owners—also known as airport sponsors—accepting CARES Act grant funds were required to continue to employ, through December 31, 2020, at least 90 percent of the number of individuals employed as of March 27, 2020. However, non-hub and non-primary airports were excluded from this workforce retention requirement. The Consolidated Appropriations Act, 2021 extended these workforce retention requirements through February 15, 2021. Airports that accept American Rescue Plan Act of 2021 grants will be subject to the same workforce retention requirements through September 30, 2021.

600 employees were affected in October 2020 when it decided to permanently close a facility in California.[44]

Non-labor Operating and Capital Investments

Passenger airlines also took a number of actions in 2020 to manage non-labor operating costs and certain capital investments. Early on in the pandemic, some passenger airlines took actions to better align supply with demand by quickly reducing the capacity and reach of their networks. They did this by reducing flight frequencies, the number of airports they served, and the size of aircraft flying certain routes (including shifting flights to regional airlines), which reduced operating costs; however, the extent to which they were able to reduce service was limited in some cases.[45] The three selected network airlines included in our earlier analysis—Delta Air Lines, American Airlines, and United Airlines—reduced system-wide capacity, as measured in available seat miles, by 54 percent in 2020 compared to 2019 levels.[46] The six selected low-cost airlines reduced system-wide capacity by 37 percent during the same time period.

Additionally, airlines also reduced costs by retiring older aircraft, delaying the delivery of new aircraft, or both, in an effort to reduce both operating and capital costs. According to FAA data, U.S. mainline carriers reduced the number of passenger jet aircraft in their fleet by an estimated 28 percent in 2020.[47] For example, American Airlines accelerated the retirement of a number of aircraft, including certain Airbus A330, Boeing 757 and Boeing 767 models, and certain regional aircraft. According to American's SEC financial reports, the aircraft retirements provided cost savings and efficiencies associated with operating fewer aircraft types.

[44]Neither manufacturer received CARES Act assistance and were therefore not limited in their ability to reduce employment levels.

[45]As authorized by the CARES Act and the Consolidated Appropriations Act, 2021, DOT required scheduled passenger airlines receiving financial assistance to maintain minimum scheduled passenger service to points in the United States served prior to the pandemic, with some exceptions, until March 1, 2022. For example, DOT has exempted airlines in cases where it is not reasonable or practicable to serve all points or all frequencies in their service obligations. Pub. L. No. 116-136, §§ 4005, 4114(b), 134 Stat. at 477, 499; Pub. L. No. 116-260, § 407, 134 Stat. at 2058-59.

[46]Available seat miles are a measure of airline output that refers to one aircraft seat flown one mile, whether occupied or not.

[47]FAA defines mainline carriers as those providing service primarily via aircraft with 90 or more seats.

Several airlines also placed some aircraft in temporary storage to reduce operating costs (see figure 4). Some airlines also reduced capital costs by delaying and deferring the delivery of new aircraft, including those scheduled for delivery in 2020 and 2021.

Figure 4: Parked Aircraft Temporarily Stored at Denver International Airport

Source: Denver International Airport. | GAO-22-104429

Airports of all sizes also took actions in 2020 to manage non-labor operating costs and capital investments. For example, representatives from one medium hub airport told us they closed parking lots and reduced shuttle services to cut operating expenses. Additionally, representatives from airports we interviewed and surveyed reported changing the timeline of capital development projects. Representatives from one medium hub airport told us the airport paused a $1.5 billion expansion project that includes the addition of 16 new gates, a seven-story parking garage, a new cargo facility, and several other improvements to the airport. At the same time, representatives from four airports we interviewed told us they accelerated the timeline of some of their capital projects to take advantage of project savings that could be realized as a result of the reduced passenger traffic. Similarly, based on our survey of smaller airports, we estimate that about one third of smaller airports modified their infrastructure project timelines. Among smaller airports that made changes to their infrastructure projects, we estimate that about 15 percent

of them cancelled projects and about 75 percent of them delayed projects, while approximately 10 percent accelerated projects.[48]

Representatives from manufacturers and repair station operators told us that they also took actions to manage operating and capital costs in response to reduced demand for commercial and business aircraft, engines, and other aviation components and associated maintenance services throughout 2020. Representatives from several aircraft manufacturers told us they reduced spending on things such as research and development, marketing, advertising, and capital expenditures. Representatives from three repair station operators told us they closed facilities, delayed previously planned expansions, or deferred other capital expenditures as demand for their services decreased.

Aviation Stakeholders Used Federal Assistance Programs to Mitigate Financial Losses

Passenger Airlines Leveraged a Variety of Assistance Programs

To help offset losses and maintain business viability, passenger airlines leveraged federal assistance that, among other things, subsidized employee payroll, provided liquidity, and made changes to tax provisions. Up to $40 billion in financial assistance payments was made available for passenger airlines by the two rounds of the Payroll Support Program (PSP) established in COVID-19 relief legislation passed in 2020 and another $14 billion in the third round of PSP established in legislation passed in 2021.[49] According to data from Department of the Treasury (Treasury), 354 first-round PSP and 302 second-round PSP agreements were signed with passenger airlines for financial assistance payments that totaled about $39.7 billion as of August 2021. The CARES Act also authorized Treasury to provide up to $29 billion for loans and loan guarantees to provide liquidity to passenger airlines, cargo airlines, repair

[48]These numbers are not mutually exclusive—one airport could have multiple projects, some of which were delayed or cancelled, and others of which were accelerated.

[49]As a condition of accepting financial assistance under the Payroll Support Program, Treasury required passenger airlines receiving more than $100 million and contractors receiving more than $37.5 million to provide warrants or notes as taxpayer protection. The American Rescue Plan Act of 2021 was enacted on March 11, 2021, and included a third round of the Payroll Support Program. As of August 2021, Treasury was continuing to sign agreements for assistance from the American Rescue Plan Act of 2021.

stations, and ticket agents.[50] Treasury executed loans that allowed 24 aviation-related businesses to bridge revenue declines and pay for ongoing expenses, including payroll and rent; the majority of the loan funds approved—$20.8 billion of a total $21.2 billion—were for seven major passenger airlines.[51] In addition, representatives from airlines reported using the tax provisions in the CARES Act[52]—which included, among other things, an employee retention credit and a delay in payment of employer payroll taxes—to bolster their liquidity. Furthermore, commercial aviation operators also benefited from a CARES Act provision suspending certain commercial air transportation taxes, including those on passenger tickets, cargo, and fuel.[53]

Representatives from passenger airlines and credit rating agencies told us that federal assistance was essential to cover airline passenger expenses, keep employees on their payrolls, and help stem cash outflows while passenger traffic levels were at historic lows. Representatives from four airlines told us that the PSP program, in particular, provided critical and timely support. For instance, representatives from two airlines emphasized that the PSP program prevented furloughs that would have resulted in employees filing unemployment claims and losing their health care benefits. Representatives from one network airline told us that the loans from Treasury also provided liquidity that was vital for them to continue to operate and maintain their infrastructure until passenger

[50]CARES Act, § 4003, 134 Stat. at 470. Section 4003 also included up to $17 billion for businesses critical to maintaining national security; however, no aviation businesses applied for this assistance.

[51]As of August 1, 2021, seven aviation-related businesses had fully repaid their loans, including six passenger airlines, as discussed later in this report. These seven loans have a total authorized value of $18.3 billion. GAO has reviewed the implementation of the loan program, including the impacts on both recipients and non-recipients, in prior work; smaller businesses did not see the same benefits from the funds as large passenger airlines. See: GAO, *COVID-19: Continued Attention Needed to Enhance Federal Preparedness, Response, Service Delivery, and Program Integrity*, GAO-21-551 (Washington, D.C.: July 19, 2021); *COVID-19: Sustained Federal Action is Crucial as Pandemic Enters Its Second Year*, GAO-21-387 (Washington, D.C.: March 31, 2021); *Financial Assistance: Lessons Learned from CARES Act Loan Program for Aviation and Other Eligible Businesses,* GAO-20-198 (Washington, D.C.: December 10, 2020); *COVID-19: Federal Efforts Could Be Strengthened by Timely and Concerted Actions*, GAO-20-701 (Washington, D.C.: September 21, 2021); and *COVID-19: Opportunities to Improve Federal Response and Recovery Efforts,* GAO-20-625 (Washington, D.C.: June 25, 2020).

[52]CARES Act, §§ 2301, 2302, 134 Stat. at 347-52.

[53]CARES Act, § 4007, 134 Stat. at 477.

demand returned. The tax-related provisions had a smaller effect on airlines than PSP assistance, but representatives from two credit rating agencies noted that the provisions helped stem airlines' cash outflows.[54] For example, according to SEC financial reports, United Airlines elected to defer the payment of $199 million in payroll taxes incurred through December 31, 2020, and will pay half in December 2021 and the remaining balance in December 2022.

Airports Leveraged Flexible Federal Assistance to Make Debt and Other Payments and Provide Assistance to Airlines and Tenants

According to our interviews, the results of our survey, and our previous reporting on federal COVID-19 assistance programs, airports of all sizes leveraged the flexibility of the federal grants provided for COVID-19 relief to make necessary debt and other payments and provide assistance to airlines and other airport tenants.[55] These federal grants of up to $20 billion in total allowed airports to respond to the COVID-19 pandemic, including funding their operations and meeting their ongoing debt payments, although the funding allocation and allowable uses for the grants differ under the CARES Act and subsequent COVID-19 relief laws.[56] FAA has begun to collect data from airports on general spending

[54]Airlines and aviation manufacturers reported using tax provisions of the CARES Act, including deferring employer payroll taxes, claiming employee retention credits, and carrying back five years net operating losses arising in tax years beginning in 2018, 2019, and 2020. Pub. L. No. 116-136, §§ 2301-2303, 134 Stat. at 347-56. The Consolidated Appropriations Act, 2021 made a number of changes to these provisions, including extending the availability of credits, among other changes. Pub. L. No. 116-260, div. N, §§ 206-207, 134 Stat. at 3059-65.

[55]GAO-21-551.

[56]The CARES Act, the Consolidated Appropriations Act, 2021, and the American Rescue Plan Act of 2021 provide a combined total of $20 billion in federal funding for U.S. airports to respond to the COVID-19 pandemic. As of May 14, 2021, of the $20 billion, about $10.6 billion has been obligated and $6.5 billion expended by FAA. Under the CARES Act, funds were available for any purpose for which airport revenues may lawfully be used. Under the Consolidated Appropriations Act, 2021 and the American Rescue Plan of 2021, funds were generally available for costs related to operations, personnel, cleaning, sanitization, janitorial services, combating the spread of pathogens at the airport, and debt service payments. According to FAA guidance, examples of eligible development to combat the spread of pathogens at the airport include replacing or upgrading a heating, ventilation, and air conditioning system, and reconfiguring the terminal to accommodate increased social distancing or health screening. Additionally, under the Consolidated Appropriations Act, 2021 and the American Rescue Plan Act of 2021, certain amounts were made available to provide relief from rent and minimum annual guarantees to airport concessions.

categories for the federal COVID-19 relief funding, but officials said that they will have limited information until airports draw down all funds for reimbursed costs.[57]

In our interviews, representatives from large and medium hub airports told us they appreciated the flexibility they had to use the CARES Act grant funding. Representatives from six large and medium hub airports told us they prioritized using the funds for routine, large expenses such as debt service payments and payroll. Representatives from one of these airports specified that they prioritized large expenses because they were among the easiest to have reimbursed by FAA. Three told us they also used the CARES Act grant funding to provide indirect relief to concessionaires such as gift shops and restaurants.[58] In addition, representatives from four large and medium hub airports told us they used the funding to avoid increasing rates they charge airlines. Airports assess fees on airlines for the use of the airport based on negotiated agreements. These agreements vary in whether the airline or the airport bears the risk if the fees paid by airlines and others do not fully cover the airport's costs. In cases where the agreement requires the airlines to make up the difference, the dramatic fall in traffic meant that fees paid by airlines would have had to rise to cover the shortfall. Representatives from large and medium hub airports with such agreements told us they applied CARES Act grant funding to certain costs to airlines to keep fees paid by airlines for landing and terminal rentals flat, when otherwise fees would have had to rise due to decreased traffic.

Based on our survey of smaller airports, we estimate that about 90 percent of smaller airports received a CARES Act Airport Grant. Of those, about half used the funds for payroll and labor expenses. When asked to

[57]FAA has begun to collect and consolidate data from airports on general spending categories for CARES Act funding through grant close-out reports, which are completed once all allocated airport funds have been expended. As of May 14, 2021, FAA officials said that 476 CARES Act airport grants, totaling $1.66 billion, have been closed out. For these grants, the majority of airport grant funds have been used for debt service (about 52 percent of these funds, totaling $864 million) and payroll (about 39 percent of these funds, totaling $643 million). While FAA continues to collect these data on airport grant spending, officials said airports are generally using CARES Act funds on payroll, utilities, minor maintenance, and debt service.

[58]The Consolidated Appropriations Act, 2021 and American Rescue Plan Act of 2021 appropriated funds for sponsors of primary airports to provide relief from rent and minimum annual guarantees to on-airport car rental, on-airport parking, and in-terminal airport concessions.

describe ways in which the CARES Act worked well in providing support, 87 airports specifically noted that the CARES Act allowed them to avoid either layoffs, furloughs of staff, or both. Smaller airports also used the funds for utilities, equipment, and debt service. Furthermore, we estimate that about one-quarter of smaller airports, and disproportionately small hub and non-hub airports, provided rent or other relief to their tenants,[59] such as deferring payments, waiving payments, and changing or adjusting lease agreements.[60]

Other Aviation and Aerospace Stakeholders Also Leveraged Federal Assistance

Several other aviation and aerospace stakeholders leveraged federal assistance, although the assistance they received was smaller in magnitude than that provided to passenger airlines and airports. For example:

- **Manufacturers:** Representatives from one manufacturer told us they used tax provisions in the CARES Act to bolster the company's liquidity, and another manufacturer reported taking similar action.[61] For example, one manufacturer reported using the 5-year net operating loss carryback provision that enabled it to record tax benefits of nearly $1.2 billion. The five manufacturers we spoke to did

[59]The estimated percentage (lower bound, upper bound) of airports reporting having provided any rent or other relief to any of the tenants operating at the airport was 81 (69, 90) percent for small hub airports, 78 (76, 80) percent for non-hub airports, 44 (42, 47) percent for non-primary commercial service airports, and 16 (13, 19) percent for general aviation and reliever airports. The margins of error between the estimate for the small hub airports and the upper or lower bounds were greater than 10 percentage points. This estimate should be interpreted with caution.

[60]When asked to describe types of rent or other relief provided to tenants at the airport, 289 airports provided a valid written response. Of these responses, 152 airports stated they deferred payments for tenants, 117 stated they waived payments from tenants, and 77 airports stated they changed and/or adjusted leases and agreements, including reducing rates and fees. Airports may have reported taken more than one measure, so totals will not add up to 100 percent.

[61]As mentioned above, airlines and aviation manufacturers reported using the tax provisions in the CARES Act, including deferring employer payroll taxes, claiming employee retention credits, and carrying back five years net operating losses arising in tax years beginning in 2018, 2019, and 2020. These provisions were not limited to aviation industry businesses. Pub. L. No. 116-136, §§ 2301-2303, 134 Stat. at 347-56. The Consolidated Appropriations Act, 2021 made a number of changes to these provisions, including extending the availability of credits, among other changes. Pub. L. No. 116-260, div. N, §§ 206-207, 134 Stat. at 3059-65.

not pursue CARES Act loans. Generally, representatives told us they preferred maintaining flexibility in their business decision-making and chose not to pursue such loans because the requirements associated with accepting assistance—which included maintaining certain employment levels–were too restrictive.[62]

Some aviation businesses, including smaller companies in the manufacturing supply chain, received Paycheck Protection Program (PPP) loans to help sustain them through the period of decreased demand during the pandemic.[63] Representatives from one large manufacturer told us they understood that a number of the companies in their supply chain had received PPP loans, and that those loans were a significant help for businesses that had been affected by the

[62]Under the Section 4003 Loan Program, recipients agreed to maintain employment levels to the extent practicable and in any case not reduce employment levels by more than 10 percent until September 30, 2020. CARES Act, § 4003(c)(2)(G), 134 Stat. at 471. Under other programs, including PSP1, PSP2, and PSP3, recipients agreed to refrain from conducting involuntary furloughs. CARES Act, § 4114(a)(1), 134 Stat. at 499; Consolidated Appropriations Act, 2021, § 404, 134 Stat.at 2055; American Rescue Plan Act of 2021, § 7301, 135 Stat. at 104-05. Additionally, the American Rescue Plan Act of 2021, passed in March 2021, included $3 billion to establish an Aviation Manufacturing Jobs Protection program. Through this program, the Department of Transportation (DOT) is to provide up to $3 billion in funding to eligible manufacturing companies to pay up to half of their compensation costs for certain categories of employees, for up to six months.

[63]The CARES Act and the Paycheck Protection Program and Health Care Enhancement Act appropriated a total of $670 billion for the Paycheck Protection Program (PPP) under the Small Business Administration's (SBA) 7(a) small business lending program. PPP loans are made at 1 percent interest and will be fully forgiven if certain conditions are met. These loans can be used for payroll and certain non-payroll costs. In general, small businesses with 500 or fewer employees, including tax-exempt nonprofit organizations, veterans organizations, and tribal businesses were eligible. Businesses in certain industries with more than 500 employees were eligible for loans. We previously reviewed the characteristics of PPP loans and the trends in small business and lender participation in PPP. See *Paycheck Protection Program: Program Changes Increased Lending to the Smallest Businesses and in Underserved Locations*, GAO-21-601 (Washington, D.C.: Sept. 21, 2021). We also reviewed aspects of SBA's implementation of the PPP, including safeguards that SBA put in place to prevent improper payments and fraud. See *Paycheck Protection Program: SBA Added Program Safeguards, but Additional Actions Are Needed,* GAO-21-577 (Washington, D.C.: July 29, 2021). Additionally, GAO previously found that SBA could take actions to improve oversight and fraud risk management of the PPP program. See, for example, *COVID-19 Loans: SBA has Begun to Take Steps to Improve Oversight and Fraud Risk Management*, GAO-21-498T (Washington, D.C.: Apr. 20, 2021); *Small Business Administration: Actions Needed to Improve COVID-19 Loans' Internal Controls and Reduce Their Susceptibility to Fraud*, GAO-21-472T (Washington, D.C.: Mar. 24, 2021); and *Small Business Administration: Steps Needed to Address COVID-19 Loan's Susceptibility to Fraud*, GAO-21-449T (Washington, D.C.: Mar. 25, 2021).

grounding of the Boeing 737 MAX aircraft in addition to the COVID-19 pandemic.

- **Repair station operators:** Treasury executed CARES Act loans totaling $19 million with five of the 41 repair station operators that applied to the program.[64] In addition to assistance from Treasury loans, the three rounds of PSP made up to $5 billion in financial assistance payments available to certain aviation contractors, including repair station operators. Two of the three repair station operators we interviewed received between $46 and $51 million in first-round PSP assistance payments. Representatives from one repair station operator said they used the assistance to retain their experienced workforce, perform necessary maintenance on their tooling and equipment, and perform training to keep their workforce current, among other things.
- **Cargo airlines:** Of the $4 billion appropriated for cargo airlines under the first round of PSP assistance to cover payroll expenses, only a fraction of the funding was used—thirty-nine cargo airlines received over $828 million in assistance.[65] Two cargo airlines received over two-thirds of these funds—$568 million. The two charter cargo airlines we spoke with received $35 million and $22 million of first-round PSP assistance. Representatives from both cargo airlines emphasized the importance of the support, stating that the assistance was critical in helping them through the first few months of the pandemic when they experienced a large decrease in demand. Representatives from one of the charter cargo airlines stated that without the PSP assistance, their airline would not have been in a financial position to survive the 3 to 4 months it took for their cargo business to return. They used the assistance to keep employees in place so that they were available when demand returned.

[64]In previous work we reported that representatives from smaller businesses told us the Treasury loan program did not work or did not work as well as it could have. See GAO-21-551.

[65]In October 2020, Representative James E. Clyburn, Chairman of the Select Subcommittee on the Coronavirus Crisis, sent letters to four cargo airlines that received a total of more than $630 million in PSP assistance, stating that it had appeared that the airlines “had financial success” during the COVID-19 pandemic. His letters called on the airlines to return the PSP assistance or demonstrate that they needed the funds to keep workers on their payroll, as Congress intended. As of September 2021, these airlines have not returned the funds. Assistance for cargo airlines was not included in the subsequent federal COVID-19 relief programs.

Aviation and Aerospace Stakeholders Raised Funding in the Financial Markets

In addition to receiving assistance from the various federal COVID-19 relief programs, many commercial aviation and aerospace stakeholders also raised funding in the financial markets to position themselves to maintain business viability until demand recovers. Representatives from several aviation industry associations and credit rating agencies told us that assistance from the CARES Act provided a degree of assurance in the stability of the market that enabled private lenders to invest in the aviation industry with greater confidence that they would be able to recoup their investments.

Major U.S. passenger airlines added an estimated $58 billion in private and federal long-term debt by the end of 2020, with their interest expenses expected to more than double in the next few years, according to A4A. As discussed earlier, throughout 2020, airlines were expending cash reserves at a rate faster than revenues could replenish and recognized that additional financing was needed to manage the dramatic drop in passenger revenue and cover fixed costs. According to public SEC financial reports, airlines issued or entered into new secured notes, loan facilities, and new aircraft financings, and raised cash proceeds from the issuance and sale of common stock, among other actions. For example, United Airlines reported $16 billion in proceeds from the issuance of debt and $2.1 billion in proceeds from equity issuance in 2020, with a total of $27.2 billion in debt and finance lease obligations at the end of 2020. Four passenger airlines—American Airlines, Hawaiian Airlines, Sun Country, and United Airlines—also turned to the financial markets in the first half of 2021 to raise funds that allowed them to pay back their CARES Act loans from the federal government.[66]

In some cases, aviation stakeholders pursued financing instead of federal COVID-19 relief assistance, citing various reasons they did not seek government financial support. Representatives from an aviation manufacturer described the provisions attached to the CARES Act loans as too restrictive and costly, stating that the company was not interested

[66]Two additional airlines—Alaska Airlines and SkyWest—also paid back their CARES Act loans from the federal government in the first half of 2021; however, their publicly available financial statements do not indicate the specific source of the funding used to repay these loans.

in providing the government with an equity stake or restricting its ability to reduce employment, as required by the loan program. Instead, representatives told us the manufacturer was able access the credit markets to obtain needed capital after the Federal Reserve's willingness to backstop the credit markets opened up credit options.[67] Separately, another manufacturer was able to issue $25 billion in new long-term debt in April 2020 to bolster its liquidity and thus did not pursue any CARES Act loans.

Aviation and Aerospace Stakeholders Took Steps to Mitigate the Spread of COVID-19

Protecting Employee Health

Stakeholders across aviation and aerospace sectors reported taking actions to protect employee health in 2020. These include such actions as requiring and providing masks, providing other personal protective equipment, implementing social distancing, and allowing employees to work from home when possible.[68] For example, representatives from a network airline reported providing on-site COVID-19 testing at its airport hubs and providing at-home testing for U.S. based employees.[69] Airlines also reported implementing remote work for employees able to do so, such as support center staff. Similarly, representatives from airports told us they implemented mask and social distancing requirements for

[67]We previously reported on the lending programs the Board of Governors of the Federal Reserve System authorized to ensure the flow of credit to various parts of the economy affected by the COVID-19 pandemic. See GAO, *Federal Reserve Lending Programs: Use of CARES Act-Supported Programs Has Been Limited and Flow of Credit Has Generally Improved,* GAO-21-180 (Washington, D.C.: Dec. 10, 2020).

[68]Personal protective equipment includes items such as N95 respirators, surgical and non-surgical masks, face shields and goggles, and gloves, among other items. Social distancing, also known as physical distancing, is the practice of maintaining physical distance from others and avoiding large gatherings, with the intent of reducing the rate of transmission of infectious diseases. COVID-19 brought social distancing practices to the forefront worldwide as a means of controlling local spread of the disease.

[69]Diagnostic testing for COVID-19 is critical to controlling and understanding the spread of the virus, according to the CDC. We previously reported on the types of COVID-19 testing in GAO, *Science & Tech Spotlight: COVID-19 Testing,* GAO-20-584SP (Washington, D.C.: May 20, 2020).

employees and allowed some staff to work remotely.[70] Representatives from a cargo airline with its own repair station told us that to maintain social distancing among employees, they had to limit the number of mechanics working on a given aircraft as well as the number of mechanics working on the same part of an aircraft at the same time. Representatives from manufacturers told us they implemented temperature checks and added social distancing where possible, including in production areas.[71] Representatives from two manufacturers also told us they developed protocols for contact tracing if employees reported positive COVID-19 infections.[72]

Protecting Passengers and Increasing Confidence in the Air Travel Experience

Airlines and airports also took actions in 2020 with an intent to protect passengers and increase passenger confidence in the air travel experience.[73] Representatives from airlines and airports we spoke to emphasized the enhanced cleaning protocols they implemented throughout their airports and on aircraft. Some airlines also changed their onboard food and beverage services to reduce interactions between passengers and crew and blocked the sale of middle seats to allow for greater distancing between passengers. Representatives from one airline and seven airports also told us they implemented contactless technology to reduce interaction between passengers and employees, such as adding automated bag drops and biometric ID checks. Representatives from six airports also told us it was important to implement consistent messaging and expectation setting about mask and social distancing

[70]Within commercial airports, the Transportation Security Administration (TSA) has responsibility for passenger screening checkpoints. For a review of measures implemented by TSA to protect its screening workforce and the traveling public, see GAO, *COVID-19: TSA Could Better Monitor Its Efforts to Reduce Infectious Disease Spread at Checkpoints*, GAO-21-364 (Washington, D.C.: June 14, 2021).

[71]Centers for Disease Control and Prevention (CDC) guidance states that screening employees for symptoms of COVID-19, such as a fever, is an optional strategy employers may use to reduce the spread of COVID-19 in the workplace.

[72]Contact tracing is a process in which public health officials attempt to limit disease transmission by identifying infected individuals, notifying their "contacts"—all the people they may have transmitted the disease to—and asking infected individuals and their contacts to quarantine, if appropriate.

[73]We have not evaluated the effectiveness of these actions, but we are currently reviewing the research surrounding the transmission of communicable disease in air travel.

requirements throughout their airports to help passengers navigate differences in requirements at different destinations (see figure 5). While some of these measures, such as contactless technology, may be maintained in the long-term, others have been changing as public health needs have evolved with the rollout of vaccines and the beginning of pandemic recovery.[74]

Figure 5: Sign at Hartsfield-Jackson Atlanta International Airport with COVID-19 Requirements and Reminders

Source: Hartsfield-Jackson Atlanta International Airport; © Decisive Moment Photojournalism. | GAO-22-104429

[74]Two COVID-19 vaccines using a two-dose regimen (Pfizer and Moderna) were authorized for emergency use in December 2020 and a third, one-dose vaccine (Johnson & Johnson) was authorized in February 2021. As of June 23, 2021, about 323 million vaccine doses have been administered, according to data reported to CDC, and about 53.1 percent of the U.S. population 12 and over—almost 150.7 million individuals—have been fully vaccinated. For additional information, see GAO-21-551.

FAA Provided Airlines and Other Aviation Sectors Temporary Relief from Some Regulatory Requirements and Selected Stakeholders Said the Changes Were Helpful

FAA Granted Airlines' Requests for Temporary Relief from Meeting Certain Regulatory Requirements

In March 2020, FAA began granting specific and temporary regulatory relief, including granting regulatory waivers, approving operational adjustments, and issuing guidance, in response to requests from airlines, airports, and their industry associations (see table 1). As aviation activity declined with the start of the pandemic, airlines and aviation associations sought FAA's assistance to ease regulatory and operational requirements that they claimed negatively affected the safety and continuity of aviation operations. For example, Airlines for America and National Air Transportation Association petitioned FAA on behalf of their members for exemptions to regulations requiring crewmembers to don emergency equipment (e.g., oxygen masks and life vests) during training.[75] These associations explained that, without a temporary exemption, such procedures could lead to the transmission of COVID-19. Associations also petitioned FAA for regulatory relief that would allow them to make operational changes. For example, Airlines for America petitioned FAA for exemptions that would allow airlines to transport cargo in a plane's passenger cabin when no passengers were present.[76] Airlines for America explained that some airlines might want to use their excess capacity to carry cargo, including critical medical cargo.

[75]14 C.F.R. § 121.417. See Regulatory Docket No. FAA-2020-0307 and FAA-2020-0291.

[76]See Regulatory Docket No. FAA-2020-0492.

Table 1: Federal Aviation Administration (FAA) Pandemic Relief Actions, March 2020-July 2021

	FAA Relief Actions (as of July 2021)	Effective Date/Expiration Date (if applicable)
Regulatory Relief	FAA's exemptions—Exemption 18510 and 18511—extended the timeframes for charter carriers' and commercial airlines ground personnel, crewmembers, and dispatchers to complete recurring training and qualification requirements. FAA granted 3 extensions for each exemption. See Regulatory Docket No. FAA-2020-0292 and FAA-2020-0308 respectively.	March 2020/ March 2021
	FAA's exemptions—Exemption 18515 and 18516—extended the duration of medical certificates for pilots and flight engineers operating flights outside of the U.S. FAA subsequently broadened the medical relief to all pilots and flight engineers through the issuance of the Special Federal Aviation Regulation (see below). See Regulatory Docket No. FAA-2020-0317 and FAA-2020-0318 respectively.	March 2020/ June 2020
	FAA's exemptions—Exemption 18509 and 18512—allowed airline crewmembers to use alternate means when conducting required emergency procedures during training, testing, and checking. For example, crewmembers were exempted from having to don oxygen masks or life vests during training. FAA granted 3 extensions for each exemption. See Regulatory Docket No. FAA-2020-0291 and FAA-2020-0307 respectively.	March 2020/ March 2021
	FAA waived the minimum usage requirement for airlines using runway slots (i.e., a take-off or landing) associated with a scheduled nonstop flight between John F. Kennedy International, New York LaGuardia, and Ronald Reagan Washington National airports and other points that were cancelled as a result of pandemic-related impacts. FAA also provided similar relief to airlines using Chicago O'Hare International, Newark Liberty International, Los Angeles International, and San Francisco International airports that prioritized flights cancelled due to pandemic-related impacts for purposes of establishing an airline's operational baseline in the next corresponding season. FAA granted 3 extensions. See Notice of Limited Waiver of the Slot Usage Requirement 85 Fed. Reg. 15,018 (Mar. 16, 2020).[a]	March 2020/ October 2021
	FAA's partial exemptions—Exemption 18561 and 18584—allowed commercial airlines to carry cargo on seats and floors in airplanes when no passengers are transported. FAA granted 2 extensions for exemption 18561 and 1 extension for exemption 18584. See Regulatory Docket No. FAA-2020-0429.	May 2020/ July 2021
	FAA's exemption—Exemption 18522—allowed flight attendants to relocate seats they would normally occupy in order to comply with recommendations from the Centers for Disease Control and Prevention concerning proximity to others. It also waived the requirement to don oxygen masks and other equipment during passenger safety briefings. FAA granted 3 extensions. See Regulatory Docket No. FAA-2020-0372.	April 2020/ June 2021
	FAA's Special Federal Aviation Regulation 118 (SFAR) provided relief to training, testing, qualification, and medical certification requirements pertaining to pilots, mechanics, and dispatchers. This included granting relief for non-commercial operations to individuals or companies that were unable to meet training duration and renewal requirements. The relief allowed the continued use of pilots and other crewmembers in support of essential operations. The SFAR also made it easier for operators to move aircraft from one storage facility to another. FAA granted 2 extensions. Relief from Certain Persons and Operations During the Coronavirus Disease 2019 (COVID-19) Outbreak, 85 Fed. Reg. 26,326 (May 4, 2020).	April 2020/ April 2021

	FAA Relief Actions (as of July 2021)	Effective Date/Expiration Date (if applicable)
	FAA's exemption—Exemption 18537—extended the timeframes for air ambulance personnel to complete recurring training and testing requirements. FAA granted 2 extensions. See Regulatory Docket No. FAA-2020-0412.	April 2020/ December 2020
Operational Adjustments	FAA allowed airlines to park unused aircraft that overflowed ordinary parking areas at airports and issued guidance to airport operators on developing a plan to park overflow aircraft and when to close runways and taxiways for temporary aircraft parking.	March 2020/ Dates varied but most overflow aircraft removed by late fall 2020
	FAA reduced operating hours of some air traffic control towers in response to decreased air traffic operations.	April 2020/ March 2021
	FAA allowed airlines that temporarily removed aircraft from service to deviate from their normal aircraft maintenance program while the aircraft was grounded.	June 2020/ August 2021
	FAA closed air traffic control towers during COVID-19 outbreaks.	July 2020/ Ongoing
Guidance and Enforcement Actions	The Department of Transportation (DOT) issued an enforcement notice to international passengers that airlines may refuse transportation to passengers with COVID-19 symptoms because they pose a direct health and safety threat.	March 2020
	DOT issued an enforcement notice to airlines requiring prompt refunds for cancelled flights.	April 2020
	FAA issued health and safety alerts and policies covering a range of topics from health guidance for crews to prevent spread of COVID-19, to safely transporting dry ice, to the observation period after pilots and air traffic controllers get vaccinated.	Various
	FAA/DOT, in collaboration with Department of Homeland Security and Department of Health and Human Services, issued an update to Runway to Recovery, a guide for airlines and airports to mitigate the public health risks of COVID-19. FAA/DOT published an update in December 2020.	July 2020
	FAA directed its investigative personnel to take stricter action in the form of civil penalties against unruly airline passengers who assault, threaten, intimidate, or interfere with airline crew members.	January 2021

Source: GAO analysis of Federal Aviation Administration information. | GAO-22-104429

[a]See also Notice of Extension of Limited Waiver of the Minimum Slot Usage Requirement, 85 Fed. Reg. 21,500 (Apr. 17, 2020); Extension of Limited Waiver of the Minimum Slot Usage Requirement, 85 Fed. Reg. 63,335 (Oct. 7, 2020); and FAA Policy Statement: Limited, Conditional Extension of COVID-19 Related Relief for the Summer 2021 Scheduling Season (Docket No. FAA-202-0862) (Jan. 13, 2021).

During 2020, FAA granted stakeholders' requests for extensions of regulatory relief as it determined that pandemic conditions warranted relief, but as of July 2021, most of FAA's relief measures had expired. By mid-2021, the public health emergency diminished, aviation operations began to normalize, and aviation stakeholders did not petition FAA for further extensions. In granting some extensions, FAA identified additional ways to mitigate potential safety impacts that might result from the extensions. For example, FAA phased out medical certification grace periods for crewmembers who had already been granted extensions and

extended the grace period relief to new cohorts of crewmembers facing imminent expiration dates.

According to FAA officials, the agency granted regulatory relief and issued guidance using its standard processes in most cases. For example, FAA followed its standard procedure in publicizing airlines' petitions for regulatory exemption and accepting public comments on those petitions.[77] However, FAA expedited some processes, which, according to FAA officials, helped both the airlines and FAA. For example, FAA did not require airlines to submit petitions for exemption 120 days before the desired effective date of the exemption,[78] allowed industry associations to submit petitions on behalf of their members, and granted exemptions to all affected airlines that submitted a letter of intent.[79] This change expedited relief because it removed the requirement that each airline must petition individually for an exemption and thus removed the need for FAA to evaluate multiple individual petitions for the same relief. FAA's exemption letters, waivers, and Special Federal Aviation Regulation (SFAR)[80] summarize the agency's reasons for

[77]FAA published some petitions for regulatory exemptions in a regulatory docket and other petitions in the *Federal Register* depending on the waiver sought. For example, in one regulatory exemption, FAA found good cause under 14 C.F.R. § 11.87 not to publish a summary of the petition in the *Federal Register* because "delaying action on the petition would have an adverse and potentially immediate impact on the petitioner's ability to ensure continuity of critical air ambulance operations essential to the public interest." In the Matter of the Petition of Air Medical Operators Association, Exemption No. 18537 (Apr. 30, 2020).

[78]Aviation stakeholders affected by a regulation in Title 14 of the Code of Federal Regulations may petition for an exemption from any rule issued by FAA under its statutory authority. The regulations governing this process (14 C.F.R. pt. 11) describe the steps for petitioning for exemptions. These steps include submitting the petition 120 days before it is needed to take effect, describing the relief needed, reasons it would not affect safety, and other information. FAA publishes information about petitions for exemption in the *Federal Register*. 14 C.F.R. § 11.85.

[79]FAA directed airlines that were requesting an exemption to submit a letter of intent to FAA. The letter of intent required the airline to affirm its request to use the exemption and its intentions to comply with the conditions and limitation of the exemption. Some exemptions contained other requirements, such as evaluating and describing how the airline would prevent negative safety impacts.

[80]According to FAA, an SFAR pertaining to airspace is typically a temporary rule to address a temporary situation. Further, FAA notes that an SFAR is generally not used to replace or enforce regulations that are to remain in effect for many years. Consequently, an SFAR has an expiration date, usually no more than 3 years from its effective date. SFARs are listed at the beginning of the most relevant Code of Federal Regulations, and may be cross-referenced to other regulations. SFARs can prohibit, restrict, or impose additional requirements to operate in the airspace to which the SFAR applies.

granting relief, its assessment of potential safety impacts, and any additional requirements airlines accepting relief must follow.

According to FAA officials, FAA's foremost considerations in evaluating the stakeholder requests for regulatory relief were whether the relief measure would have an adverse effect on safety or would not be in the public interest, and would facilitate the continuity of aviation operations. FAA officials said that focusing on aviation stakeholder requests enabled the agency to quickly address the most critical operational issues.

FAA took other actions in addition to providing regulatory relief. For example, in March 2020, FAA created a rapid response team that was a focal point for gathering and responding to airport operators' and other stakeholders' questions and concerns. According to FAA officials, the team's main purpose was to create a channel of communication with industry, quickly tackle any issue brought to its attention, and elevate issues that need broader attention. For example, the team fielded questions ranging from where to obtain hand sanitizer to who needs to know about overflow aircraft parking plans. Since its inception, the team has cataloged over 750 requests for information and policy decisions.

Airlines Credited FAA for Quick Actions in Support of Continuing Operations

The airlines we contacted commented that FAA's actions demonstrated its ability to provide operational relief quickly. FAA officials stated that the agency's efficiency was due in part to industry input because industry stakeholders—particularly airline associations—identified regulatory relief that was critical to continuing operations. According to FAA officials, some exemptions were beneficial to airlines and the public because the exemptions enabled airlines to maintain qualified crewmembers. These officials said other exemptions were beneficial because they reduced crewmembers' potential exposure to COVID-19 during training or operations and two airlines we contacted agreed. For example, one airline said that by allowing flight attendants to sit in seats throughout the plane at a distance from crewmembers and passengers (not in their designated jump seat), FAA likely helped airlines reduce the spread of the virus. FAA officials stated that it was up to each airline whether to apply for regulatory relief and that not all airlines did so. The airlines we contacted said they chose the exemptions that fit their operations. One airline ceased training pilots on aircraft used for international flights while another allowed its flight dispatchers to work from home. One airline

official stated that although exempting crewmembers from demonstrating safety equipment was likely only marginally helpful, pilots and flight attendants appreciated that their safety was being acknowledged.

The Extent of Industry Recovery Remains Uncertain and Stakeholders Identified Considerations for Potential Federal Support

Uncertainty about the Ongoing Recovery Remains despite Rebound in U.S. Leisure Travel

Recovery in U.S. Leisure Travel is Slowing

Passenger airlines experienced a resurgence in demand for domestic leisure travel in the spring and summer of 2021; however, their recovery has been slowed by operational challenges and concerns about the COVID-19 Delta variant. In March 2021, the credit rating agency Fitch Ratings noted that a decline in COVID-19 death rates could be sufficient to loosen pandemic restrictions, increase consumer comfort with the idea of traveling, and begin a rebound in air travel.[81] Fitch cautioned that the emergence of highly transmissible variants could extend the pandemic and delay a recovery in air travel in the United States and Canada.

According to the most recent BTS data available as of September 2021, passenger airlines carried 66 million passengers within the United States in July 2021, which was more than double passenger levels in either January or February 2021, and a roughly 191 percent increase compared to July 2020. In response to increasing demand for domestic leisure travel, U.S. airlines began adapting flight operations and their workforce levels in spring 2021. For example, in April 2021, United Airlines announced plans to hire 300 new pilots, and American Airlines announced it would add 150 new routes on its network in summer 2021.

[81]Fitch Ratings, *North American Airline and Airport Pressures to Ease, Accelerating Recovery Later This Year*, Fitch Wire (Mar., 11, 2021).

On June 11, 2021, 2 million people crossed TSA airport security checkpoints, the highest level since March 7, 2020.[82]

However, in certain cases, the fast rebound in demand for air travel has exceeded airlines' ability to return capacity to service, resulting in cancelled and rescheduled flights. For example, Spirit Airlines cancelled more than 2,000 flights between late July and early August. According to airlines, the increase in cancellations are due to a combination of staffing shortages, weather, and information technology problems.[83] As noted above, many airlines reduced their staffing through voluntary and involuntary measures as a cost cutting measure and are now trying to hire and train more staff. However, retraining and recertifying some staff, especially pilots, can be a lengthy process.

The emergence and spread of the COVID-19 Delta variant appears to have contributed to weakened demand for air travel in late summer 2021. On July 27, 2021, prompted by a rise in COVID-19 case and hospitalization rates around the country, the CDC released updated guidance urging an increase in vaccination coverage around the country and recommending that people in areas of substantial or high transmission wear a mask in public or indoor places, even if they are fully vaccinated. On August 11, Southwest Airlines reported that bookings have slowed and trip cancellations have increased, which the airline attributed to the recent rise in COVID-19 cases associated with the Delta variant. According to the Airlines Reporting Corporation, tickets sales for the week of August 9 were down 41 percent compared to 2019, the worst differential between 2021 and 2019 sales since mid-May. The TSA reported that it screened 1,607,238 air passengers on August 17, a 28 percent decline from the 2,238,462 passengers screened on August 1. However, this decline also coincided with the summer travel season

[82]In June, the Centers for Disease Control and Prevention (CDC) updated its guidance to advise that fully vaccinated travelers could safely travel within the United States and U.S. territories provided that they continue to wear a mask as required on planes, buses, trains, and other forms of public transportation traveling into, within, or out of the United States and while indoors at U.S. transportation hubs such as airports and stations. The CDC also advised that travelers follow all state and local recommendations and requirements, including for mask wearing and social distancing.

[83]In 2019, we reported on airline technology issues, noting that federal regulators do not have data on airline technology outages, but we noted at least 34 instances of outages and the vast majority resulted in delays and cancellations. GAO, *Commercial Aviation: Information on Airline IT Outages*, GAO-19-514 (Washington DC; Jun 12, 2019).

winding down; in August 2019, there was a 16 percent decline in passengers screened over the same period.

International and Business Air Travel Continue to Lag

Although U.S. airlines experienced a rebound in demand for domestic leisure travel in 2021, demand for international and business travel has lagged and is likely to continue to do so, according to aviation industry stakeholders including credit rating agencies and consulting firms. As discussed previously, international and business travel are critical contributors to the profitability of network airlines. According to McKinsey, for example, business travelers can account for 55–75 percent of airline profits.[84] Some stakeholders project that it will take until sometime in the 2023–2025 period for a return to pre-pandemic traffic levels. These stakeholders note that international and business travel recovery are also dependent on factors including the progress of vaccine dissemination outside of the U.S. and the extent to which businesses continue to use videoconferencing in lieu of in-person meetings.

Demand for international air travel remains depressed in late summer 2021, and may not recover to pre-pandemic levels for several years, according to industry observers. International air travel remains roughly 40 percent below 2019 levels in early September 2021, according to A4A, and the consulting firm Oliver Wyman has projected that, based on pandemic-related travel restrictions, the growing number of infections due to COVID-19 variants, and the lack of progress in vaccine dissemination outside of the United States, international travel will not recover until 2023 or 2024.[85]

Industry analysts also expect a lag in the return of demand for business air travel. Moody's reported in March 2021 that the extent to which virtual meetings will replace business travel in the longer term is unknown, and estimated that 10–30 percent of this segment may not return after the pandemic. According to Moody's, factors that may limit the recovery of business travel include (1) greater use and familiarity with virtual meeting technologies, (2) a desire to continue to reap savings from reduced travel that were gained during the pandemic, (3) an increased interest in reducing carbon emissions, and (4) a greater emphasis on prioritizing travel dollars where they provide the greatest benefit, such as when it

[84]McKinsey & Company, *For corporate travel, a long recovery ahead* (August 2020).

[85]Oliver Wyman, *Airline Economic Analysis 2020-21*.

helps to promote customer relationships or revenue generation. Notably, Moody's reported that while travel to meet with customers may return relatively quickly, trips related to conventions or trade shows could be slower to recover. Forecasts from several industry observers vary, but generally converge on expecting a multi-year period for a return to pre-pandemic levels of business travel. For example, Moody's forecasted in March 2021 that business travel will not reach 2019 levels until at least 2024,[86] and McKinsey estimated in April 2021 that business travel will likely recover to 80 percent of pre-pandemic levels by 2024.[87] The U.S. Travel Association and research firm Tourism Economics forecast in July 2021 that business travel will return to 76 percent of 2019 levels in 2022, 92 percent in 2023, and finally exceed 2019 levels in 2024.

The Aviation Industry's Recovery to Financial Health Depends on How It Adapts to the Evolving Market in the Coming Years

The recovery of the aviation industry to profitability and financial health depends on how various aviation sectors—predominantly airlines, but also airports, manufacturers, and repair station operators—are able to adapt to evolving market conditions in the coming years. How sectors adapt, in turn, may result in changes to business models and operations.

Passenger Airlines

Industry analysts suggest that based on the expected lag in recovery for international and business air travel, airlines that serve primarily domestic routes and rely on leisure travel, such as low-cost airlines, are better positioned for near-term recovery than airlines that have focused on business and international travel. For example, Delta Air Lines, United Airlines, and American Airlines generate at least a third of their revenue from business travelers, according to Moody's.[88] As a result, these airlines may face challenges in regaining their previous level of profitability if demand for business travel does not quickly return to pre-pandemic levels. Airlines may act to offset the possible effects of a slow recovery in business travel by more conservatively managing capacity

[86]Moody's Investors Service, *Business Travel Faces Higher Substitution Risk Post-COVID, But Airlines Will Adapt* (Mar. 24, 2021).

[87]McKinsey & Company, *Back to the future? Airline sector poised for change post-COVID-19* (April 2021).

[88]Moody's Investors Service, *Business Travel Faces Higher Substitution Risk Post-COVID, But Airlines Will Adapt* (Mar. 24, 2021).

dedicated to such routes, increasing their focus on leisure travel, and raising leisure fares, according to Moody's. In particular, they may choose to reconfigure aircraft cabins to focus on serving more leisure travelers, with less business-class seating and more economy or premium seating. According to Oliver Wyman's *Airline Economic Analysis 2020–2021*, a near-term focus on leisure travel will alter aspects of airlines' demand forecasting and capacity planning, as patterns of leisure demand are different than business demand.

Airports

U.S. airport operators are also likely to face several challenges resulting from reduced air travel demand caused by the pandemic. In a dynamic similar to that facing U.S. airlines, airports oriented toward domestic leisure travel are expected to rebound more quickly than international gateway airports or those with a high reliance on business travelers, according to a March 2021 Fitch Ratings report. In January 2021, S&P Global Ratings reported that airports that have traditionally relied on strong business and international travel may have more difficulty or take longer to compensate for a loss of non-aeronautical revenues from parking, concessions, and rental car operations if the travelers that patronize these businesses are slow to return.[89]

Airports may also face challenges in capital planning moving forward, as airports reported deferring or delaying such projects during the pandemic. According to Airports Council International–North America, airports face a backlog of $115 billion in planned capital investments. Among other capital planning considerations, some smaller airports may face challenges in accommodating increasing passenger volumes with social distancing protocols still in place. For example, one industry analyst told us that airports that are near outdoor leisure destinations like national parks are experiencing increased demand, but have comparatively small physical footprints.

Manufacturers and Repair Station Operators

Evolving market conditions are affecting the airline industry's demand for new aircraft as well as for maintenance services, with associated effects

[89]S&P Global Ratings, *Outlook for U.S. Not-for-Profit Transportation Infrastructure: Light at Tunnel's End–But How Long is the Tunnel?* (Jan. 13, 2021).

for manufacturers, repair stations, and other businesses in the aviation supply chain.

- **Manufacturing.** According to S&P Global Ratings, Airbus and Boeing reduced production of most aircraft models by 30–50 percent in 2020 in response to airline decisions to defer or cancel new aircraft orders. S&P forecasts that aircraft production rates are likely to remain at this level in 2021 and may not reach 2018 levels until 2024.[90] Based on recovering demand for domestic leisure travel, airline demand for narrowbody aircraft will likely recover before demand for the widebodies used for long-haul, international travel.[91] Boeing, for example, reported slowing production of the widebody 787 aircraft from 14 per month before the pandemic to five per month as of March 31, 2021 based on reduced customer demand. However, according to Boeing's data on airplane gross orders, orders for aircraft have increased recently. In January and February 2021, Boeing received orders for 86 aircraft; from March through July, the manufacturer received orders for 544 aircraft, the bulk of which are for the narrowbody 737 MAX.
- **Maintenance, Repair, and Overhaul.** A December 2020 report from S&P Global Ratings forecasted that repair stations may recover in line with increased demand for air travel as airlines bring aircraft back into service. Similarly, officials from the Aeronautical Repair Station Association (ARSA) told us in May 2021 that they are seeing a return in demand for aircraft maintenance service as network airlines return aircraft to service. According to ARSA, as demand has increased, pre-pandemic concerns about an industry shortage in aviation maintenance technicians have resumed.

Aviation Industry Stakeholders Identified Considerations for Potential Federal Support

During our review, aviation industry stakeholders identified several areas of concern for policymakers to consider as they determine how or whether to continue to assist the aviation industry as COVID-19 relief funds are expended and market conditions evolve. Additionally,

[90]S&P Global Ratings, *Industry Top Trends 2021–Aerospace and Defense* (Dec. 10, 2020).

[91]Narrowbody aircraft have one aisle, whereas widebody aircraft have two aisles.

stakeholders noted considerations for policymakers in preparing a federal aviation response to future pandemics.

Strengthening the Aviation Workforce Pipeline

As a result of workforce reductions undertaken in response to the pandemic, a key concern moving forward will be maintaining healthy workforce pipelines for key aviation professions including airline pilots and aviation maintenance technicians, according to representatives from airlines and repair stations we spoke with. These pipelines include collegiate training programs and apprenticeships. We have previously reported on industry concerns that an insufficient supply of airline pilots and maintenance technicians could develop as a result of retirements, education and training costs, and difficulty hiring individuals with desired experience levels.[92] An Oliver Wyman study forecasts that a pilot shortage—a concern before the pandemic—will reemerge quickly and may exceed 12,000 pilots by 2023.[93] Although reduced demand from the pandemic temporarily alleviated these pressures, they appear to have reemerged as firms face difficulty in replacing skilled aviation workers who were encouraged to retire, were laid off, or migrated to other industries during the industry downturn in 2020. In March 2021, the American Rescue Plan Act of 2021 was enacted, establishing the Aviation Manufacturing Jobs Protection (AMJP) Program. Through this program, DOT is to provide up to $3 billion in funding to eligible aviation manufacturing companies to pay up to half of their compensation costs for certain categories of employees, for up to six months.[94] As we testified in March 2021, aviation workforce retraining and efforts to strengthen the pipeline of new applicants for aviation careers, such as through apprenticeships and pathway programs, could help ensure the workforce is ready to respond to future air travel demand.[95]

[92]GAO, *Aviation Workforce: Current and Future Availability of Airline Pilots*, GAO-14-232 (Washington, D.C.: Feb. 28, 2014), and *Aviation Workforce: Current and Future Availability of Aviation Maintenance and Engineering Professionals,* GAO-14-237 (Washington, D.C.: Feb. 28, 2014).

[93]Oliver Wyman, “After COVID-19, Aviation Faces a Pilot Shortage.” March 2021.

[94]§ 7202, 135 Stat. 4, 103-04.

[95]GAO, *COVID-19 Pandemic: Preliminary Observations on Efforts toward and Factors Affecting the Aviation Industry’s Recovery*, GAO-21-412T (Washington, D.C.: Mar. 2, 2021).

Providing Small Communities Access to the National Transportation System

While communities of all sizes seek access to air service as a driver for attracting investment, generating employment, and providing mobility for citizens, as we have reported, small communities were collectively losing air service prior to COVID-19, and the pandemic may exacerbate this trend.[96] DOT has required airlines receiving payroll payments and loans to maintain some service levels to small communities, as authorized by COVID-19 relief laws. In addition, the Consolidated Appropriations Act, 2021 set aside up to $5 million of the $2 billion appropriated for Grants-in-Aid for Airports for the Small Community Air Service Development Program (SCASDP).[97] In addition, the Act directed that in allocating this funding and SCASDP funding for fiscal years 2019, 2020, and 2021, DOT give priority to communities that have had airline service reduced or suspended as a result of the pandemic.

As DOT ends these air service obligations in March 2022, some small communities may face a reduction in or a complete loss of air service as airlines focus on more profitable markets during recovery. Aviation stakeholders such as the Regional Airline Association have suggested that Congress address service reductions stemming from the pandemic by providing funding for Essential Air Service (EAS) and SCASDP to maintain service to small communities.[98] We and others have found that a broader set of issues is driving the longer-term decline of air service to small communities, and solutions provided through other options such as

[96]GAO, *Small Community Air Service Development: Process for Awarding Grants Could Be Improved*, GAO-19-172 (Washington, D.C.: March 26, 2019), and *Commercial Aviation: Status of Air Service to Small Communities and the Federal Programs Involved*, GAO-14-454T (Washington, D.C.: April 30, 2014).

[97]SCASDP is a grant program designed to help small communities address air service and airfare issues. For more information, see GAO-19-172.

[98]The Airline Deregulation Act of 1978, which established the EAS program, specifies that if DOT determines that if air service will not be provided without subsidy, DOT shall use EAS program funds to award a subsidy to an airline willing to provide service. For more information, see GAO, *Commercial Aviation: Effects of Changes to the Essential Air Service Program, and Stakeholders' Views on Benefits, Challenges, and Potential Reforms*, GAO-20-74 (Washington, D.C.: Dec. 10, 2019).

bus service or unscheduled air taxi service, or in the longer term, Advanced Air Mobility technologies, may be worth consideration.[99]

Considering Future Financial Assistance

The airline industry received substantial financial support from several COVID-19 relief assistance programs that aided businesses and protected jobs, but some analysts noted potential downsides to that support. While this assistance helped businesses respond to the unprecedented demand shock by keeping many workers on the payroll and enabled airlines and other businesses to be better prepared to meet demand when it returned, some analysts believe that it also may have deterred market adjustments that likely would have occurred in the absence of substantial assistance.[100] For example, economic contraction and expansion—leading in some cases to mergers, restructuring, and liquidation—have been a feature of the airline industry since its deregulation in 1978. Despite the dramatic downturn in traffic and revenues, only two small airlines filed for bankruptcy in 2020.[101] Although it may be too soon to examine these issues empirically, some analysts believe that pandemic relief could have delayed industry adjustments that might have proven to be beneficial in the long run. For example, business failure and new entry can spur relatively rapid and substantive readjustments in business models at minimal cost to taxpayers. According to some analysts, financial support also rewarded management, creditors, and shareholders that were shielded from the financial consequences of risks they had assumed.[102] Additionally, analysts note that the industry might suffer if, based on the recent

[99]Department of Transportation, *Report of the Working Group on Improving Air Service to Small Communities* (Washington, D.C.: May 9, 2017), and GAO, *National Transportation System: Options and Analytical Tools to Strengthen DOT's Approach to Supporting Communities' Access to the System* (Washington, D.C.: July 17, 2009). See also The National Academies of Sciences, Engineering, and Medicine, *Advancing Aerial Mobility: A National Blueprint*, (Washington, D.C.: 2020).

[100]Veronique de Rugy and Gary Leff, *The Case Against Bailing Out the Airline Industry*, George Mason University Mercatus Center, March 2020.

[101]Ravn Air and Air Miami International filed for Chapter 11 bankruptcy in 2020.

[102]Veronique de Rugy and Gary Leff, *The Case Against Bailing Out the Airline Industry*, George Mason University Mercatus Center, March 2020. See also Veronique de Rugy and Gary Leff, *The Economic Case Against a Second Airline Payroll Bailout*, George Mason University Mercatus Center, October 2020, and Hubert Horan, "The Airline Industry after COVID-19: Value Extraction or Recovery?" *American Affairs*, Spring 2021.

pandemic relief, airlines expect federal financial assistance when shocks to air travel demand occur in the future.[103] That expectation might limit the steps firms would otherwise take to prepare for future disruptions, and as such, could hamper the industry's development of longer-run resilience to respond to such events.

Preparing for the Next Pandemic

Several aviation stakeholders we spoke with in 2020 and early 2021, including representatives from airports and airlines, told us that passenger confidence in the air travel experience could have been restored more quickly if the federal government had provided greater coordination and guidance earlier in the pandemic regarding, among other things, COVID-19 testing, masking requirements, and baseline actions—such as sanitizing and updating signage—that airports and airlines could take.[104] For example, representatives from one airport told us that inconsistent passenger procedures between origin and destination airports were a major challenge, and that the federal government has a pivotal role to play in restoring passenger confidence in flying. Such federal coordination and guidance is consistent with our June 2020 matter urging Congress to take legislative action to require DOT to work with relevant agencies and stakeholders, such as the Department of Health and Human Services (HHS) and the Department of Homeland Security (DHS), to develop a national aviation preparedness plan for communicable disease outbreaks.[105] This plan would provide a mechanism for public health and aviation sectors to coordinate to limit the

[103]Veronique de Rugy and Gary Leff, *The Case Against Bailing Out the Airline Industry*, George Mason University Mercatus Center, March 2020.

[104]These interviews were conducted before President Biden's January 2021 executive order requiring mask-wearing on certain domestic modes of transportation.

[105]In 2015, we recommended that the Secretary of Transportation work with relevant stakeholders, such as the Department of Health and Human Services (HHS), to develop a national aviation-preparedness plan for communicable diseases. DOT agreed that an aviation-preparedness plan is needed. DOT, however, maintains that those agencies that have both legal authority and expertise for emergency response and public health—namely the Department of Homeland Security (DHS) and HHS—are best positioned to take the lead role in developing such a plan. We continue to believe that DOT would be in the best position to lead the effort because FAA and DOT have stronger and deeper ties to, as well as oversight responsibility for, the relevant stakeholders that would be most involved in such a broad effort, namely airlines, airports, and other aviation stakeholders. In June 2020, we urged Congress to take legislative action to require DOT to develop a national aviation-preparedness plan. See GAO-20-625.

spread of communicable disease threats and minimize trade and travel impacts. Without such a plan, the U.S. may not be as prepared to minimize and quickly respond to future communicable disease threats. Members of the House and Senate have introduced bills in support of this matter. In February 2021, H.R. 884, the National Aviation Preparedness Plan Act of 2021,[106] was introduced in the House of Representatives, and in May 2021, the Ensuring Health Safety in the Skies Act of 2021,[107] was reported favorably out of the Senate Committee on Commerce, Science, and Transportation.

Agency Comments

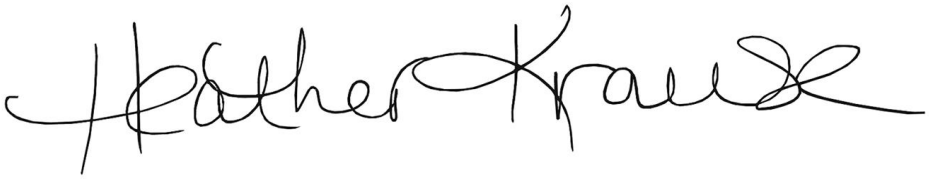
We provided a copy of this report to DOT for review and comment. DOT provided technical comments, which we incorporated as appropriate.

We are sending copies of this report to the appropriate congressional committees, the Secretary of Transportation, and other interested parties. In addition, the report is available at no charge on the GAO website at http://www.gao.gov.

[106]H.R. 884, 117th Cong. (2021).

[107]S. 82, 117th Cong. (2021).

If you or your staff have any questions about this report, please contact Heather Krause at (202) 512-2834 or krauseh@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. GAO staff who made key contributions to this report are listed in appendix III.



Heather Krause
Director, Physical Infrastructure Issues

List of Addressees
The Honorable Patrick Leahy
Chair
The Honorable Richard Shelby
Vice Chairman
Committee on Appropriations
United States Senate

The Honorable Ron Wyden
Chair
The Honorable Mike Crapo
Ranking Member
Committee on Finance
United States Senate

The Honorable Patty Murray
Chair
The Honorable Richard Burr
Ranking Member
Committee on Health, Education, Labor, and Pensions
United States Senate

The Honorable Gary C. Peters
Chairman
The Honorable Rob Portman
Ranking Member
Committee on Homeland Security and Governmental Affairs
United States Senate

The Honorable Kyrsten Sinema
Chair
The Honorable James Lankford
Ranking Member
Subcommittee on Government Operations and Border Management
Committee on Homeland Security and Governmental Affairs
United States Senate

The Honorable Rosa L. DeLauro
Chair
The Honorable Kay Granger
Ranking Member
Committee on Appropriations
House of Representatives

The Honorable Frank Pallone, Jr.
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Republican Leader
Committee on Energy and Commerce
House of Representatives

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Chair
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Committee on Homeland Security
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The Honorable James Comer
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Committee on Oversight and Reform
House of Representatives

The Honorable Peter A. DeFazio
Chair
The Honorable Sam Graves
Ranking Member
Committee on Transportation and Infrastructure
House of Representatives

The Honorable Richard Neal
Chair
The Honorable Kevin Brady
Republican Leader
Committee on Ways and Means
House of Representatives

The Honorable Garret Graves
Ranking Member
Subcommittee on Aviation
Committee on Transportation and Infrastructure
House of Representatives

Appendix I: Objectives, Scope, and Methodology

This report addresses (1) the effects of the COVID-19 pandemic on selected aviation and aerospace industry sectors; (2) the actions, if any, that selected stakeholders took in response; (3) actions the Federal Aviation Administration took to help the aviation industry respond to the pandemic, and selected aviation stakeholders' perspectives on those actions; and (4) the outlook for aviation industry recovery, and stakeholder considerations for potential federal support in assisting the aviation industry in the future.

To identify the effects of the pandemic on selected aviation industry sectors, we analyzed Department of Transportation (DOT) Form 41 financial and operational data for calendar years 2019 and 2020—the most recent and complete data available. All dollar figures in this report are nominal unless otherwise noted. To assess the reliability of these data, we reviewed the quality control procedures used by DOT and subsequently determined that the data were sufficiently reliable for our purposes. We also analyzed financial statements reported to the Securities and Exchange Commission by publicly-traded airlines and other aviation businesses from the first quarter through the fourth quarter of 2020 to obtain quantitative information on their financial performance as well as qualitative descriptions of the impact of the pandemic on businesses and actions those businesses took in response.[1] We reported on the immediate effects of the pandemic based on the expectation that other effects will be long-term.

We conducted interviews about the effects of the COVID-19 pandemic on selected aviation and aerospace industry sectors and actions stakeholders took in response with a judgmental sample of 47 aviation and aerospace industry stakeholders, including six passenger airlines (two network, two low-cost, and two regional airlines); three cargo airlines; 11 large and medium hub airports; five airframe, engine, or aerostructures manufacturers; three repair stations that provide aircraft maintenance, repair, and overhaul services; two commercial space launch providers; two aviation labor organizations; one engineering and analytics firm; three credit rating agencies; two aviation industry analysts;

[1]The four quarters cover the 12 months of calendar year 2020.

and nine industry associations. We selected stakeholders to represent a cross-section of sectors within the aviation and aerospace industries as well as based on geographic representation. Because we used a judgmental sample of industry stakeholders, findings from these interviews cannot be generalized to a broader population. However, we determined that the selection of these stakeholders was appropriate for our design and objectives and that these interviews would generate valid and reliable evidence to support our work. See table 2 for the list of stakeholders we interviewed.

Table 2: Selected Aviation and Aerospace Industry Stakeholders GAO Interviewed

U.S. federal agencies
Department of Transportation
Federal Aviation Administration

Analytics and engineering firms
BryceTech, LLC

Industry associations
Aeronautical Repair Station Association
Aerospace Industries Association
Aircraft Owners and Pilots Association
Airports Council International–North America
American Association of Airport Executives
Commercial Spaceflight Federation
General Aviation Manufacturers Association
National Business Aviation Association
Satellite Industry Association

Aviation labor organizations
Airline Pilots Association
International Association of Machinists and Aerospace Workers

Passenger airlines
American Airlines
Delta Air Lines
Frontier Airlines
Spirit Airlines

SkyWest Airlines
Mesa Airlines

Cargo airlines
United Parcel Service
Western Global Airlines
USA Jet Airlines

Aviation manufacturers
Boeing
GE Aviation
Gulfstream Aerospace
Spirit AeroSystems
Textron Aviation

Repair station operators
Aviation Technical Services
HAECO Americas
Velocity Aerospace

Large and medium hub airports
Baltimore/Washington Thurgood Marshall International Airport
Bradley International Airport
Chicago O'Hare International Airport
Cleveland-Hopkins International Airport
Dallas-Fort Worth International Airport
Denver International Airport
Hartsfield-Jackson Atlanta International Airport
Nashville International Airport
Norman Y. Mineta San Jose International Airport
Pittsburgh International Airport
St. Louis Lambert International Airport

Commercial space launch providers
Blue Origin
Space-X

Credit rating agencies
Fitch Ratings
Moody's Investors Service
S&P Global Ratings

Aviation industry analysts
Helane Becker, Cowen Group
William Swelbar, Swelbar–Zhong Consultancy

Source: GAO. | GAO 22-104429

Survey of Smaller Airports

To identify the effects of the COVID-19 pandemic on smaller airports (i.e., small hub, non-hub, non-primary commercial service, general aviation, and reliever airports), and actions those airports took in response, we designed and administered a web-based survey of a stratified random sample of smaller airports from November 16, 2020, to December 11, 2020.

Survey Population and Sample Design

We constructed the population of airports for our survey sample using data on existing and proposed airports from the Federal Aviation Administration's 2019-2023 National Plan of Integrated Airport Systems (NPIAS), the most recent version available when we began our audit work. Using NPIAS data, we determined that there were (1) 380 primary airports—including 30 large hub, 31 medium hub, 72 small hub, and 247 non-hub airports; (2) 2,941 non-primary airports—including 126 non-primary commercial service airports, 2,554 general aviation airports, and 261 reliever airports;[2] and (3) 7 proposed airports. We excluded from this population large hub and medium airports, non-primary airports with an unclassified role, airports outside of the continental U.S., and proposed airports. The outcome was a survey sample frame of 2,752 airports that included 64 small hub airports, 209 non-hub airports, 63 non-primary commercial service airports, and 2,416 general aviation and reliever airports.

We selected a stratified random sample of 1,136 airports that included 64 small hub airports, 209 non-hub airports, 63 non-primary commercial airports, and 800 general aviation and reliever airports. Small hub, non-hub, and non-primary commercial service airports were selected with certainty. To determine the appropriate sample size for the general aviation and reliever airports, we determined the minimum sample size needed to achieve precision levels of percentage estimates within plus or minus 5 percentage points. We then increased this sample size for an expected response rate of 64 percent in order to achieve the necessary number of completed surveys for our desired precision level (see table 3). We obtained completed questionnaires from 817 respondents, or about a 72 percent unweighted response rate. The weighted response rate was

[2]Non-primary airports are categorized as either national, regional, local, basic, or unclassified.

65 percent. The survey results can be generalized to the target population of 2,752 smaller airports.

Table 3: Description of the Sample Frame, Stratification, and Sample Sizes for the Stratified Random Sample of Smaller Airports

Stratum	Population size	Sample size	Number of completed surveys
Small hub	64	64	59
Non-hub	209	209	183
Non-primary commercial service	63	63	61
General aviation and reliever	2,416	800	514
Total	**2,752**	**1,136**	**817**

Source: GAO, based on analysis of Federal Aviation Administration data. | GAO-22-104429

Note: Small hub, non-hub, and non-primary commercial service airports were selected with certainty.

Administration of Survey and Quality Assurance

We developed a questionnaire to obtain information about the effects of the COVID-19 pandemic on smaller airports, and the actions these airports took in response. On November 9, 2020, we sent an initial email alerting airport contacts to the upcoming web-based survey, and a week later, the web-based survey was also delivered to recipients via email message. Our email message described the purpose and topic of the survey, and encouraged the respondent to consult with other individuals in the provider's organization if that would increase the accuracy of their responses. The web-based survey requested information on, among other things, the effects of the pandemic on scheduled commercial passenger air service and airport revenue streams; changes in airport operating expenses and capital improvement projects; the outlook for businesses operating on airport property including repair stations, fixed base operators, pilot schools, aviation maintenance technician schools, and concessions; and airport use of CARES Act grant funding. To help increase our response rate, we sent reminder emails on December 3 and December 8, 2020 and called airport contacts. The survey was available from November 16 through December 11, 2020. Our survey included both closed-ended and open-ended questions. We performed a content analysis on select open-ended questions, whereby one analyst coded all comments using a list of developed categories, and a second analyst independently coded the first 100 responses for each selected question, then reviewed the remaining assigned codes for selected questions as a quality assurance step.

To pretest the questionnaire, we conducted interviews with officials from eight airports with knowledge about their airport's operations. Each pretest was conducted on the phone. We selected pretest respondents to represent a range of airport categories in different parts of the country. We conducted these pretests to determine if the questions were burdensome, understandable, and measured what we intended, and to ensure we could identify an appropriate individual who was knowledgeable about their airport operations to respond to the survey. On the basis of feedback from the pretests, we modified the questions as appropriate.

Sampling Error and Estimation

To produce the estimates from this survey, answers from each responding case were weighted in the analysis to generalize to the members of the population, including those who were not selected or did not respond to the survey. Estimates produced from this sample are generalizable to the target population of 2,752 smaller airports.

Because our results are based on a sample and different samples could provide different estimates, we express our confidence in the precision of our particular sample's results as a 95 percent confidence interval. We are 95 percent confident that each of the confidence intervals in this report include the true values in the study population. Unless we note otherwise, percentage estimates based on all airports have 95 percent confidence intervals of within plus or minus 10 percentage points.

Non-Sampling Error

In addition to the reported sampling errors, the practical difficulties of conducting any survey may introduce other types of errors, commonly referred to as non-sampling errors. For example, differences in how a particular question is interpreted, the sources of information available to respondents, or the types of people who do not respond can introduce unwanted variability into the survey results. We included steps in both the data collection and data analysis stages for the purpose of minimizing such non-sampling errors.

We took the following steps to increase the response rate: pre-testing the questionnaires with airports, and conducting multiple follow-ups to identify the appropriate contact at some airports and to encourage responses to the survey.

Survey Analysis

We analyzed the response status to our survey to identify potential sources of nonresponse bias, in accordance with best practices in survey research and echoed in Office of Management and Budget, Standards and Guidelines for Statistical Surveys (September 2006). We examined the response propensity of the sampled airports using both bivariate and multivariate logistic regression models. The factors we examined included airport characteristics available for respondents and non-respondents on the NPIAS sample frame: airport ownership, role, the number of revenue passengers that boarded aircraft (enplanements), the 5-year estimate of airport improvements eligible for federal development grants under the Airport Improvement Program, the number of aircraft hangered or based at the airport, and the stratification variable that combined hub and airport category. We detected significant associations between the probability of response and the stratification variable, role, enplanements, and number of based aircraft.

We adjusted for the characteristics significantly associated with response propensity using weighting class adjustments. Specifically, we grouped the predicted response propensity derived from our logistic regression model using quintiles of the predicted response propensity distribution to form five weighting adjustment groups. We applied nonresponse adjustments to the sampling weights within these groups to form nonresponse-adjusted analysis weights used in our survey analyses.

The nonresponse bias analysis and subsequent weighted adjustments only included variables available on the NPIAS sample frame and did not account for unobserved variables that could potentially be related to the likelihood of response. However, based on our knowledge of aviation operations, we did not expect survey responses or the likelihood of response to vary by other airport characteristics. Based on this nonresponse bias analysis and resulting nonresponse-adjusted analysis weights, we determined that estimates using these weights are generalizable to the population of smaller airports and are sufficiently reliable for the purposes of our reporting objectives.

We compared—as appropriate—weighted survey estimates generated by the airport strata described above. For each subgroup, we produced percentage estimates and standard errors for each level and used these results to confirm the significance of the differences between weighted survey estimates.

To identify the actions the Federal Aviation Administration (FAA) took to help the aviation industry respond to the pandemic, we reviewed requests for regulatory relief submitted to FAA by aviation stakeholders and FAA's regulatory rulemakings, exemptions, and extensions, as well as operational guidance. We interviewed officials from FAA divisions responsible for implementing these actions as well as those of the 47 aviation and aerospace stakeholders selected whose operations were potentially affected by these actions.

To describe the outlook for aviation industry recovery and stakeholder considerations for potential federal support in assisting the aviation industry in the future, we reviewed forecasts published by aviation industry stakeholders, including consulting firms, credit rating agencies, and an aviation manufacturer, and synthesized their findings. We also interviewed the 47 aviation and aerospace industry stakeholders to obtain their perspectives on considerations for federal assistance, and reviewed our prior work on civil aviation and federal assistance to the private sector.

We conducted this performance audit from July 2020 through October 2021 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Appendix II: Survey of Smaller Airports

This appendix contains selected questions from our survey of smaller airports and their responses. Our web-based survey of a stratified random sample of small hub, non-hub, non-primary commercial service, and general aviation and reliever airports was administered from November 16, 2020 to December 11, 2020. Our survey was comprised of two types of questions: those for which several possible answers were provided to choose from (closed-ended) and those that allowed respondents to provide their own answers (open-ended). We did not verify the statements of those who completed the survey. In this appendix, we include selected survey questions and aggregate results of responses to both closed-ended and open-ended questions. Using professional judgment, we excluded some survey questions from our analysis due to the timing of our survey field period and report issuance. The survey results for the closed-ended questions were weighted in our analysis to be generalizable to the members of our target population of 2,752 smaller airports, including those who were not selected or that did not respond to our survey. General aviation and reliever airports made up the majority (about 88 percent) of smaller airports (see table 4). For all questions that ask for a comparison between 2019 and 2020, the respondent was presented with a range of options, including: (1) decrease by 76-100%, 51-75%, 26-50%, 10-25%, or less than 10%; (2) about the same (roughly 0%); and (3) increase by more than 100%, 76-100%, 51-75%, 26-50%, 10-25%, or less than 10%. In our analysis, we collapsed the response categories in order to produce statistically reliable estimates. For selected open-ended questions, we performed a non-generalizable content analysis of written responses. For a detailed discussion of our survey methodologies, see appendix I.

Results for the generalizable, closed-ended questions are presented below with lower and upper bounds for 95 percent confidence intervals. We have noted where the margin of error between the estimate and the upper or lower bound is greater than 10 or 20 percentage points:

- Superscript “a”: The margin of error between the estimate and the upper or lower bound is greater than 10 percentage points, and therefore should be interpreted with caution.

- DNR (data not reliable): The margin of error between the estimate and upper or lower bound is greater than 20 percentage points and was considered unreliable; these estimates were not included in our findings.

Table 4. The Population Size and Distribution of Smaller Airports by Survey Strata

Strata	Population size	Percent
Small hub	64	2
Non-hub	209	8
Non-primary commercial service	63	2
General aviation/reliever	2,416	88
Total	**2,752**	**100**

Source: GAO, based on analysis of Federal Aviation Administration data. | GAO-22-104429

Survey of Smaller Airports

Is scheduled commercial passenger air service provided at your airport?

	Estimated percentage (lower bound, upper bound)				
Response	Total	Small hub	Non-hub	Non-primary commercial service	General aviation/reliever
Yes	**14 (13, 15)**	100 (95, 100)	97 (93, 99)	93 (84, 98)	2 (1,4)
No	**86 (85, 87)**	0 (0, 5)	3 (1, 7)	7 (2, 16)	98 (96,99)

A. If yes, what was the estimated change in scheduled commercial passenger air service, as measured by enplanements, when comparing the following months from 2019 and 2020?

April 2019 vs April 2020

	Estimated percentage (lower bound, upper bound)				
Response	Total	Small hub	Non-hub	Non-primary commercial service	General aviation/reliever
Decrease					
>50%	**90 (85, 93)**	97 (88, 100)	94 (89,97)	85 (73, 94)[a]	DNR
1-50%	**8 (4, 12)**	3 (0, 12)	5 (2, 10)	7 (2, 18)[a]	DNR
Roughly 0%	**2 (0, 5)**	0 (0, 5)	0 (0, 2)	4 (0, 13)	DNR
Increase	**0 (0,2)**	0 (0, 5)	1 (0, 3)	0 (0, 5)	DNR

Response	Estimated percentage (lower bound, upper bound)				
	Total	Small hub	Non-hub	Non-primary commercial service	General aviation/reliever
Don't know	**1 (0, 2)**	0 (0, 5)	0 (0, 2)	4 (0, 13)	DNR

September 2019 versus September 2020

Response	Estimated percentage (lower bound, upper bound)				
	Total	Small hub	Non-hub	Non-primary commercial service	General aviation/reliever
Decrease					
>50%	**64 (60, 69)**	77 (65, 87)	69 (66,71)	53 (50, 55)	DNR
1-50%	**31 (27, 35)**	23 (13, 35)	28 (26, 31)	38 (25, 52)[a]	DNR
Roughly 0%	**2 (1, 6)**	0 (0, 5)	1 (0, 4)	2 (0, 10)	DNR
Increase	**1 (0, 4)**	0 (0, 5)	2 (0, 5)	4 (0, 13)	DNR
Don't know	**1 (0, 2)**	0 (0, 5)	0 (0, 2)	4 (0, 13)	DNR

Is unscheduled/charter air service provided at your airport?

Response	Estimated percentage (lower bound, upper bound)				
	Total	Small hub	Non-hub	Non-primary commercial service	General aviation/reliever
Yes	**35 (32, 39)**	78 (65, 88)	75 (72, 77)	62 (60, 64)	30 (27, 34)
No	**65 (61, 68)**	22 (12, 35)	25 (23, 28)	38 (36, 40)	70 (66, 73)

A. If yes, what was the estimated change in unscheduled/charter air service, as measured by enplanements, when comparing the following months from 2019 and 2020?

April 2019 vs April 2020

Response	Estimated percentage (lower bound, upper bound)				
	Total	Small hub	Non-hub	Non-primary commercial service	General aviation/reliever
Decrease	**67 (62, 72)**	72 (57, 84)[a]	79 (71, 85)	58 (41, 74)[a]	64 (58, 71)
Roughly 0%	**15 (11, 20)**	11 (4, 24)[a]	10 (5, 16)	16 (6, 31)[a]	17 (11, 23)
Increase	**7 (5, 11)**	4 (1, 15)[a]	2 (1, 6)	5 (1, 18)[a]	9 (5, 14)
Don't know	**11 (8, 15)**	13 (5, 26)[a]	9 (5, 15)	21 (10, 37)[a]	11 (6, 16)

September 2019 vs. September 2020

	Estimated percentage (lower bound, upper bound)				
Response	Total	Small hub	Non-hub	Non-primary commercial service	General aviation/reliever
Decrease	**58 (53, 63)**	70 (54, 82)[a]	72 (69, 74)	50 (47, 53)	55 (47, 62)
Roughly 0%	**19 (14, 23)**	11 (4, 24)[a]	10 (6, 17)	18 (8, 34)[a]	21 (15, 28)
Increase	**12 (9, 16)**	7 (1, 18)[a]	9 (5, 15)	11 (3, 25)[a]	14 (9, 20)
Don't know	**11 (8, 15)**	13 (5, 26)[a]	9 (5, 15)	21 (10, 37)[a]	11 (6, 17)

Is non-mail cargo air service provided at your airport?

	Estimated percentage (lower bound, upper bound)				
Response	Total	Small hub	Non-hub	Non-primary commercial service	General aviation/reliever
Yes	**13 (11, 15)**	81 (69, 90)[a]	49 (47, 52)	40 (38, 42)	7 (5, 10)
No	**87 (85, 89)**	19 (10, 31)[a]	51 (48, 53)	60 (58, 62)	93 (90, 95)

A. If yes, what was the estimated change in non-mail cargo air service, as measured by weight (either pounds or tonnage), when comparing the following months from 2019 and 2020?

April 2019 vs April 2020

	Estimated percentage (lower bound, upper bound)				
Response	Total	Small hub	Non-hub	Non-primary commercial service	General aviation/reliever
Decrease	**36 (30, 43)**	54 (50, 58)	42 (39, 46)	DNR	29 (16, 46)[a]
Roughly 0%	**35 (28, 42)**	15 (6, 28)[a]	27 (18, 37)[a]	DNR	42 (26, 59)[a]
Increase	**15 (10, 21)**	31 (19, 46)[a]	15 (8, 24)	13 (3, 32)[a]	11 (3, 25)[a]
Don't know	**14 (9, 20)**	0 (0, 6)	16 (9, 25)	8 (1, 27)[a]	18 (7, 33)[a]

September 2019 vs September 2020

	Estimated percentage (lower bound, upper bound)				
Response	Total	Small hub	Non-hub	Non-primary commercial service	General aviation/reliever
Decrease	**26 (19, 32)**	30 (17, 45)[a]	22 (14, 32)[a]	DNR	28 (14, 45)[a]

	Estimated percentage (lower bound, upper bound)				
Response	Total	Small hub	Non-hub	Non-primary commercial service	General aviation/reliever
Roughly 0%	**33 (26, 40)**	15 (6, 28)[a]	29 (26, 33)	DNR	37 (22, 54)[a]
Increase	**27 (22, 33)**	55 (51, 59)	33 (29, 36)	DNR	17 (7, 32)[a]
Don't know	**14 (9, 21)**	0 (0, 6)	16 (9, 25)	8 (1, 27)[a]	18 (8, 34)[a]

Are there general aviation operations at your airport?
(General aviation operations may include business jet operations, turboprops, piston airplanes, or helicopters. Please do not include military operations in your response.)

	Estimated percentage (lower bound, upper bound)				
Response	Total	Small hub	Non-hub	Non-primary commercial service	General aviation/reliever
Yes	**95 (93, 96)**	98 (91, 100)	99 (97, 100)	100 (95, 100)	94 (92, 96)
No	**5 (4, 7)**	2 (0, 9)	1 (0, 3)	0 (0, 5)	6 (4, 8)

A. If yes, what was the estimated change in general aviation operations when comparing the following months from 2019 and 2020?

April 2019 vs April 2020

	Estimated percentage (lower bound, upper bound)				
Response	Total	Small hub	Non-hub	Non-primary commercial service	General aviation/reliever
Decrease					
>50%	**29 (26, 32)**	52 (48, 55)	41 (39, 44)	36 (24, 49)[a]	27 (24, 31)
1-50%	**40 (36, 43)**	38 (34, 41)	40 (38, 43)	38 (36, 40)	40 (36, 44)
Roughly 0%	**18 (15, 21)**	2 (0, 9)	7 (4, 11)	11 (5, 22)[a]	20 (16, 23)
Increase	**8 (6, 10)**	7 (2, 17)	6 (3, 11)	7 (2, 16)	8 (6, 11)
Don't know	**5 (4, 7)**	2 (0, 9)	6 (3, 10)	8 (3, 18)	5 (3, 7)

September 2019 vs September 2020

	Estimated percentage (lower bound, upper bound)				
Response	Total	Small hub	Non-hub	Non-primary commercial service	General aviation/reliever
Decrease					
>50%	**14 (12, 17)**	5 (1, 14)	17 (12, 23)	20 (11, 32)[a]	14 (11, 17)
1-50%	**42 (39, 46)**	60 (57, 64)	44 (42, 47)	41 (39, 43)	41 (38, 45)
Roughly 0%	**21 (18, 24)**	9 (3, 19)[a]	8 (4, 13)	11 (5, 22)[a]	23 (19, 26)
Increase	**17 (15, 20)**	24 (14, 37)[a]	25 (23, 27)	20 (11, 32)[a]	17 (14, 19)
Don't know	**5 (4, 7)**	2 (0, 9)	6 (3, 10)	8 (3, 18)	5 (3, 8)

What was the estimated change in your airport's aeronautical operating revenue, when comparing the months of September 2019 versus September 2020?

	Estimated percentage (lower bound, upper bound)				
Response	Total	Small hub	Non-hub	Non-primary commercial service	General aviation/reliever
Decrease					
>50%	**14 (12, 17)**	30 (19, 44)[a]	38 (36, 41)	15 (7, 26)[a]	12 (9, 15)
1-50%	**44 (40, 47)**	54 (51, 58)	54 (51, 57)	54 (52, 56)	42 (38, 46)
Roughly 0%	**28 (25, 31)**	5 (1, 14)	2 (0, 5)	18 (9, 30)[a]	31 (27, 34)
Increase	**9 (7, 11)**	10 (4, 21)[a]	6 (3, 10)	10 (4, 20)[a]	10 (7, 13)
Don't know	**5 (4, 7)**	0 (0, 5)	1 (0, 3)	3 (0, 11)	6 (4, 8)

What was the estimated change in your airport's Passenger Facility Charges (PFCs), when comparing the months of September 2019 versus September 2020?

(If your airport does not collect PFCs, please select "not applicable.")

	Estimated percentage (lower bound, upper bound)				
Response	Total	Small hub	Non-hub	Non-primary commercial service	General aviation/reliever
Decrease	**64 (57, 70)**	93 (83, 98)	97 (93, 99)	79 (62, 91)[a]	25 (14, 40)[a]
Roughly 0%	**28 (22, 35)**	2 (0, 9)	1 (0, 4)	12 (3, 27)[a]	60 (45, 74)[a]
Increase	**3 (1, 6)**	3 (0, 12)	0 (0, 2)	6 (1, 20)[a]	5 (1, 15)[a]
Don't know	**5 (3, 10)**	2 (0, 9)	2 (0, 5)	3 (0, 15)[a]	10 (3, 22)[a]

What was the estimated change in your airport's non-aeronautical operating revenue, when comparing the months of September 2019 versus September 2020?

	Estimated percentage (lower bound, upper bound)				
Response	Total	Small hub	Non-hub	Non-primary commercial service	General aviation/reliever
Decrease					
>50%	**10 (8, 12)**	47 (44, 51)	32 (30, 34)	13 (6, 24)[a]	7 (5, 9)
1-50%	**20 (17, 22)**	48 (44, 51)	54 (51, 57)	31 (20, 44)[a]	16 (13, 19)
Roughly 0%	**51 (48, 55)**	3 (0, 12)	8 (4, 13)	39 (37, 42)	57 (53, 61)
Increase	**4 (3, 5)**	0 (0, 5)	5 (2, 9)	7 (2, 16)	4 (2, 6)
Don't know	**15 (13, 18)**	2 (0, 9)	1 (0, 4)	10 (4, 20)[a]	17 (14, 20)

Does your airport have non-aeronautical land leases?

	Estimated percentage (lower bound, upper bound)				
Response	Total	Small hub	Non-hub	Non-primary commercial service	General aviation/reliever
Yes	**47 (43, 50)**	91 (81, 97)[a]	76 (74, 78)	70 (57, 81)[a]	42 (38, 46)
No	**53 (50, 57)**	9 (3, 19)[a]	24 (22, 26)	30 (19, 43)[a]	58 (54, 62)

Have any measures been taken to generate additional revenue at your airport since the start of the COVID-19 pandemic?

	Estimated percentage (lower bound, upper bound)				
Response	Total	Small hub	Non-hub	Non-primary commercial service	General aviation/reliever
Yes	**26 (24, 29)**	61 (58, 65)	45 (42, 48)	26 (16, 39)[a]	24 (21, 27)
No	**74 (71, 76)**	39 (35, 42)	55 (52, 58)	74 (61, 84)[a]	76 (73, 79)

A. If yes, please describe any measures taken to generate additional revenue.

Identified revenue measures	Number of responses
Built or developed revenue opportunities (built structures to rent out, developed land for lease, etc.)	59
Filled office or land vacancies (empty, available resources were filled with rent-paying tenants)	62
Increased marketing (additional advertising/marketing efforts to raise awareness about opportunities to bring business to the airport)	37

Identified revenue measures	Number of responses
Opportunistic and/or temporary measures (revenue-generating activities taking advantage of low activity at airport, adapting to COVID-19 precautions, etc., that are likely to be discontinued once aviation recovers)	26
Created incentives (efforts that would directly encourage or drive demand, through promos, discounts, etc.)	29
Raised rates and/or fees	18
Pursued favorable agreements (airports worked to gain greater efficiency with their agreements/pursuing more favorable terms for themselves, e.g. tenants with lower rates, renegotiated contracts)	17
Sold assets (airports sold off land or other assets in order to raise revenue)	7

Note: The above results are based on a content analysis of written responses. A total of 249 respondents provided a valid, written response to this question. Respondents may have mentioned more than one measure taken, therefore responses do not add up to 100 percent. There were also 60 comments made regarding airport revenue measures that did not fall into the identified categories.

Have any of the following measures been taken to reduce operating costs at your airport since the start of the COVID-19 pandemic?

A. Hiring freezes

	Estimated percentage (lower bound, upper bound)				
Response	Total	Small hub	Non-hub	Non-primary commercial service	General aviation/reliever
Yes	**29 (26, 32)**	75 (62, 85)[a]	57 (54, 59)	38 (36, 41)	25 (22, 28)
No	**46 (43, 49)**	24 (14, 37)[a]	41 (39, 44)	55 (53, 57)	47 (43, 51)
Don’t know	**0 (0, 1)**	0 (0, 5)	0 (0, 2)	0 (0, 5)	0 (0, 1)
Not applicable	**25 (22, 28)**	2 (0, 9)	2 (0, 5)	7 (2, 16)	28 (24, 31)

B. Staff layoffs

	Estimated percentage (lower bound, upper bound)				
Response	Total	Small hub	Non-hub	Non-primary commercial service	General aviation/reliever
Yes	**6 (5, 8)**	19 (10, 31)[a]	14 (10, 20)	3 (0, 12)	5 (3, 7)
No	**72 (69, 75)**	80 (67, 89)[a]	84 (78, 89)	92 (82, 97)[a]	70 (67, 74)
Don't know	**0 (0, 1)**	0 (0, 5)	0 (0, 2)	0 (0, 5)	0 (0, 2)
Not applicable	**21 (18, 24)**	2 (0, 9)	2 (0, 5)	5 (1, 14)	24 (21, 27)

C. Reduce staff hours

	Estimated percentage (lower bound, upper bound)				
Response	Total	Small hub	Non-hub	Non-primary commercial service	General aviation/reliever
Yes	**20 (17, 22)**	39 (35, 42)	34 (32, 37)	22 (12, 34)[a]	18 (15, 21)
No	**61 (58, 64)**	56 (52, 60)	66 (63, 68)	73 (60, 84)[a]	60 (57, 64)
Don't know	**0 (0, 1)**	0 (0, 5)	0 (0, 2)	0 (0, 5)	0 (0, 1)
Not applicable	**19 (16, 22)**	5 (1, 14)	0 (0, 2)	5 (1, 14)	21 (18, 25)

D. Reduce staff travel

	Estimated percentage (lower bound, upper bound)				
Response	Total	Small hub	Non-hub	Non-primary commercial service	General aviation/reliever
Yes	**44 (41, 48)**	98 (91, 100)	88 (83, 93)	75 (62, 85)[a]	38 (34, 42)
No	**29 (26, 32)**	0 (0, 5)	10 (6, 16)	20 (11, 32)[a]	31 (28, 35)
Don't know	**0 (0, 1)**	0 (0, 5)	0 (0, 2)	2 (0, 9)	0 (0, 1)
Not applicable	**27 (23, 30)**	2 (0, 9)	1 (0, 4)	3 (0, 12)	30 (27, 34)

E. Reduce staff training

	Estimated percentage (lower bound, upper bound)				
Response	Total	Small hub	Non-hub	Non-primary commercial service	General aviation/reliever
Yes	**26 (23, 29)**	47 (44, 51)	54 (51, 56)	36 (24, 49)[a]	23 (20, 26)
No	**53 (50, 57)**	48 (44, 51)	46 (43, 48)	63 (60, 65)	54 (50, 58)
Don't know	**0 (0, 1)**	2 (0, 9)	0 (0, 2)	0 (0, 5)	0 (0, 1)
Not applicable	**20 (17, 23)**	3 (0, 12)	1 (0, 3)	2 (0, 9)	23 (20, 27)

F. Defer debt finance

	Estimated percentage (lower bound, upper bound)				
Response	Total	Small hub	Non-hub	Non-primary commercial service	General aviation/reliever
Yes	**3 (2, 5)**	8(3, 19)[a]	8 (5, 13)	7 (2, 16)	2 (1, 4)
No	**65 (61, 68)**	80 (67, 89)[a]	75 (73, 78)	78 (65, 88)[a]	63 (59, 67)
Don't know	**4 (3, 5)**	2 (0, 9)	2 (1, 6)	5 (1, 14)	4 (2, 6)
Not applicable	**29 (25, 32)**	10 (4, 21)[a]	14 (9, 20)	10 (4, 21)[a]	31 (27, 35)

G. Defer maintenance

	Estimated percentage (lower bound, upper bound)				
Response	Total	Small hub	Non-hub	Non-primary commercial service	General aviation/reliever
Yes	**23 (21, 26)**	52 (48, 55)	35 (33, 38)	28 (17, 41)[a]	21 (18, 25)
No	**62 (58, 65)**	48 (45, 52)	65 (62, 67)	70 (57, 81)[a]	62 (58, 65)
Don't know	**1 (0, 2)**	0 (0, 5)	0 (0, 2)	0 (0, 5)	1 (0, 2)
Not applicable	**14 (11, 17)**	0 (0, 5)	0 (0, 2)	2 (0, 9)	16 (13, 19)

H. Other

	Estimated percentage (lower bound, upper bound)				
Response	Total	Small hub	Non-hub	Non-primary commercial service	General aviation/reliever
Yes	**9 (6, 12)**	49 (44, 53)	24 (16, 34)	8 (1, 26)[a]	6 (4, 10)
No	**36 (32, 41)**	18 (7, 33)[a]	28 (19, 38)[a]	DNR	37 (32, 43)
Don't know	**3 (2, 6)**	0 (0, 7)	4 (1, 11)	8 (1, 26)[a]	3 (2, 6)
Not applicable	**51 (47, 56)**	33 (19, 50)[a]	43 (40, 47)	DNR	53 (48, 58)

Have you made any changes to any ongoing or planned (within the next year) infrastructure/capital improvement projects since the start of the COVID-19 pandemic?

	Estimated percentage (lower bound, upper bound)				
Response	Total	Small hub	Non-hub	Non-primary commercial service	General aviation/reliever
Yes	**30 (27, 33)**	80 (67, 89)[a]	42 (39, 45)	38 (36, 41)	27 (24, 31)
No	**68 (65, 71)**	20 (11, 33)[a]	57 (55, 60)	58 (56, 61)	70 (67, 74)
Not applicable	**2 (1, 4)**	0 (0, 5)	1 (0, 3)	3 (0, 12)	3 (1, 4)

A. If yes, how, if at all, has the scope/timeline for the project(s) been impacted by COVID-19? Please check all that apply.

Project Cancelled

	Estimated percentage (lower bound, upper bound)				
Response	Total	Small hub	Non-hub	Non-primary commercial service	General aviation/reliever
Checked	**14 (10, 19)**	25 (14, 40)[a]	21 (12, 31)[a]	4 (0, 22)[a]	13 (8, 20)
Not checked	**86 (81, 90)**	75 (60, 86)[a]	79 (69, 88)[a]	96 (78, 100)[a]	87 (80, 92)

Project Delayed

	Estimated percentage (lower bound, upper bound)				
Response	Total	Small hub	Non-hub	Non-primary commercial service	General aviation/reliever
Checked	**77 (72, 82)**	92 (80, 98)[a]	77 (66, 86)[a]	DNR	77 (69, 84)
Not checked	**23 (18, 28)**	8 (2, 20)[a]	23 (14, 34)[a]	DNR	23 (16, 31)

Project Accelerated

	Estimated percentage (lower bound, upper bound)				
Response	Total	Small hub	Non-hub	Non-primary commercial service	General aviation/reliever
Checked	**11 (8, 16)**	11 (4, 23)[a]	18 (10, 29)[a]	DNR	10 (6, 16)

	Estimated percentage (lower bound, upper bound)				
Response	Total	Small hub	Non-hub	Non-primary commercial service	General aviation/reliever
Not checked	**89 (84, 92)**	89 (77, 96)[a]	82 (71, 90)[a]	DNR	90 (84, 94)

Other

	Estimated percentage (lower bound, upper bound)				
Response	Total	Small hub	Non-hub	Non-primary commercial service	General aviation/reliever
Checked	**7 (5, 11)**	6 (1, 18)[a]	10 (5, 19)	DNR	7 (3, 12)
Not checked	**93 (89, 95)**	94 (82, 99)[a]	90 (81, 95)	DNR	93 (88, 97)

Is your airport at risk of defaulting on any outstanding obligations?

Estimated percentage (lower bound, upper bound)					
Response	Total	Small hub	Non-hub	Non-primary commercial service	General aviation/reliever
Yes	**3 (1, 6)**	7 (1, 24)[a]	9 (4, 18)	DNR	1 (0, 6)
No	**97 (94, 99)**	93 (76, 99)[a]	91 (82, 96)	DNR	99 (94, 100)

Is your airport at risk of closing/ceasing all operations?

Estimated percentage (lower bound, upper bound)					
Response	Total	Small hub	Non-hub	Non-primary commercial service	General aviation/reliever
Yes	**2 (1, 5)**	0 (0, 11)[a]	5 (2, 13)	DNR	1 (0, 6)
No	**98 (95, 99)**	100 (89, 100)[a]	95 (87, 98)	DNR	99 (94, 100)

Do any repair stations operate on your airport's property, whether airport-owned/operated or non-airport owned/operated? (According to FAA, the term "Repair Station" refers to a maintenance facility that has a certificate issued by the FAA under Title 14 of the Code of Federal Regulations (14 C.F.R.) Part 145 and is engaged in the maintenance, inspection, and alteration of aircraft and aircraft products. FAA rules are specific on who can perform maintenance and approve an aircraft, airframe, engines, etc., for return to service after maintenance has been performed.)

	Estimated percentage (lower bound, upper bound)				
Response	Total	Small hub	Non-hub	Non-primary commercial service	General aviation/reliever
Yes	**47 (44, 50)**	73 (60, 83)[a]	63 (60, 65)	62 (60, 64)	45 (41, 48)
No	**53 (50, 56)**	27 (17, 40)[a]	37 (35, 40)	38 (36, 40)	55 (52, 59)

A. **If yes, if known, how would you describe the overall impact COVID-19 has had on this repair station/these repair stations?**
(If more than one business of this type is operating at your airport, please report the overall impact on these businesses at your airport.)

	Estimated percentage (lower bound, upper bound)				
Response	Total	Small hub	Non-hub	Non-primary commercial service	General aviation/reliever
Negative	**50 (45, 54)**	65 (49, 79)[a]	55 (52, 59)	63 (46, 78)[a]	48 (42, 53)
No impact	**25 (21, 29)**	12 (4, 25)[a]	13 (7, 20)	21 (10, 37)[a]	27 (22, 32)
Positive	**8 (6, 11)**	2 (0, 12)	7 (3, 13)	3 (0, 14)[a]	9 (6, 13)
Don't know	**17 (14, 21)**	21 (10, 36)[a]	25 (17, 34)	13 (4, 28)[a]	16 (12, 22)

Do any fixed base operators (FBOs) operate on your airport's property, whether airport-owned/operated or non-airport owned/operated?
(FBO services may include fueling, hangaring, tie down and parking, aircraft rental, aircraft maintenance, and similar services.)

	Estimated percentage (lower bound, upper bound)				
Response	Total	Small hub	Non-hub	Non-primary commercial service	General aviation/reliever
Yes	**77 (74, 80)**	98 (90, 100)	98 (95, 100)	95 (94, 96)	74 (71, 78)
No	**23 (20, 26)**	2 (0, 10)	2 (0, 5)	5 (1, 14)	26 (22, 29)

A. If yes, if known, how would you describe the overall impact COVID-19 has had on this FBO/these FBOs?

	Estimated percentage (lower bound, upper bound)				
Response	**Total**	**Small hub**	**Non-hub**	**Non-primary commercial service**	**General aviation/reliever**
Very/moderately negative	**45 (41, 48)**	61 (58, 65)	62 (59, 65)	42 (40, 44)	42 (38, 47)
Slightly negative	**30 (27, 34)**	23 (13, 36)[a]	24 (22, 27)	28 (17, 42)[a]	31 (27, 35)
No impact	**12 (10, 15)**	2 (0, 9)	3 (1, 7)	9 (3, 19)[a]	14 (11, 18)
Positive	**8 (6, 10)**	9 (3, 19)[a]	6 (3, 10)	12 (5, 24)[a]	8 (5, 11)
Don't know	**5 (4, 7)**	5 (1, 15)	5 (2, 9)	9 (3, 19)[a]	5 (3, 8)

Do any pilot schools operating under Part 141 regulations operate on your airport's property, whether airport-owned/operated or non-airport owned/operated?

(FAA-certificated pilot schools are regulated in accordance with Title 14 of the Code of Federal Regulations (14 C.F.R.) Part 141. Unlike pilot training conducted under 14 C.F.R. Part 61, Part 141 pilot schools are required to use a structured training program and syllabus. Part 141 pilot schools may be able to provide a greater variety of training aids and require dedicated training facilities, flight instructor oversight, and FAA-approved course curricula. Colleges and universities, which may offer aviation degrees, often provide pilot training under Part 141.)

	Estimated percentage (lower bound, upper bound)				
Response	**Total**	**Small hub**	**Non-hub**	**Non-primary commercial service**	**General aviation/reliever**
Yes	**25 (22, 28)**	51 (47, 54)	45 (43, 48)	25 (14, 37)[a]	23 (20, 26)
No	**75 (72, 78)**	49 (46, 53)	55 (52, 57)	75 (63, 86)[a]	77 (74, 80)

A. **If yes, if known, how would you describe the overall impact COVID-19 has had on this school/these schools?**

(If more than one business of this type is operating at your airport,

please report the overall impact on these businesses at your airport.)

	Estimated percentage (lower bound, upper bound)				
Response	Total	Small hub	Non-hub	Non-primary commercial service	General aviation/reliever
Negative	**60 (53, 66)**	67 (47, 83)[a]	62 (58, 66)	DNR	59 (51, 66)
No impact	**15 (11, 21)**	7 (1, 22)[a]	11 (5, 20)	DNR	17 (11, 25)
Positive	**13 (9, 19)**	17 (6, 35)[a]	11 (5, 19)	DNR	14 (8, 21)
Don't know	**11 (8, 16)**	10 (2, 27)[a]	16 (9, 26)	DNR	11 (6, 18)

Do any aviation maintenance technician schools operate on your airport's property, whether airport-owned/operated or non-airport owned/operated?

(An Aviation Maintenance Technician School (AMTS) is an educational facility certificated by the FAA to train prospective aircraft mechanics for careers in the airline industry, in aviation maintenance facilities, and in commercial and General Aviation (GA). 14 C.F.R. Part 147 specifies requirements for the certification and operation of an AMTS. The regulation includes both the curriculum requirements and the operating rules for all certificated AMTSs.)

	Estimated percentage (lower bound, upper bound)				
Response	Total	Small hub	Non-hub	Non-primary commercial service	General aviation/reliever
Yes	**5 (4, 7)**	24 (14, 37)[a]	12 (7, 17)	5 (1, 14)	4 (2, 6)
No	**95 (93, 96)**	76 (63, 86)[a]	88 (83, 93)	95 (86, 99)	96 (94, 98)

A. **If yes, if known, how would you describe the overall impact COVID-19 has had on this school/these schools?**

(If more than one business of this type is operating at your airport, please report the overall impact on these businesses at your airport.)

	Estimated percentage (lower bound, upper bound)				
Response	Total	Small hub	Non-hub	Non-primary commercial service	General aviation/reliever
Negative	**57 (44, 70)[a]**	DNR	DNR	DNR	DNR
No impact	**8 (2, 18)[a]**	0 (0, 19)[a]	DNR	DNR	DNR
Positive	**8 (2, 21)[a]**	0 (0, 19)[a]	5 (0, 24)[a]	DNR	DNR
Don't know	**28 (16, 42)[a]**	DNR	DNR	DNR	DNR

Do any paid parking concessions operate on your airport's property, whether airport-owned/operated or non-airport owned/operated?

	Estimated percentage (lower bound, upper bound)				
Response	Total	Small hub	Non-hub	Non-primary commercial service	General aviation/reliever
Yes	**8 (6, 10)**	88 (77, 95)[a]	60 (57, 62)	7 (2, 16)	2 (1, 3)
No	**92 (90, 94)**	12 (5, 23)[a]	40 (38, 43)	93 (84, 98)	98 (97, 99)

A. **If yes, if known, how would you describe the overall impact COVID-19 has had on this business?**
(If more than one business of this type is operating at your airport, please report the overall impact on these businesses at your airport.)

	Estimated percentage (lower bound, upper bound)				
Response	Total	Small hub	Non-hub	Non-primary commercial service	General aviation/reliever
Negative	**91 (82, 96)**	98 (90, 100)	99 (95, 100)	DNR	DNR
No impact	**8 (3, 17)**	0 (0, 6)	0 (0, 3)	DNR	DNR
Positive	**0 (0, 3)**	0 (0, 6)	1 (0, 5)	DNR	DNR
Don't know	**0 (0, 3)**	2 (0, 10)	0 (0, 3)	DNR	DNR

Do any car rental or ground transportation concessions operate on your airport's property, whether airport-owned/operated or non-airport owned/operated?

	Estimated percentage (lower bound, upper bound)				
Response	Total	Small hub	Non-hub	Non-primary commercial service	General aviation/reliever
Yes	**26 (24, 29)**	100 (95, 100)	98 (94, 99)	79 (66, 88)[a]	17 (14, 19)
No	**74 (71, 76)**	0 (0, 5)	2 (1, 6)	21 (12, 34)[a]	83 (81, 86)

A. **If yes, if known, how would you describe the overall impact COVID-19 has had on this business?**
(If more than one business of this type is operating at your airport, please report the overall impact on these businesses at your airport.)

	Estimated percentage (lower bound, upper bound)				
Response	Total	Small hub	Non-hub	Non-primary commercial service	General aviation/reliever
Very moderately/ negative	**65 (60, 71)**	90 (79, 96)[a]	82 (76, 87)	65 (49, 78)[a]	53 (43, 62)
Slightly negative	**16 (12, 20)**	8 (3, 19)[a]	12 (7, 17)	19 (9, 33)[a]	18 (11, 28)
No impact	**6 (3, 10)**	0 (0, 5)	0 (0, 2)	2 (0, 11)	11 (5, 19)
Positive	**4 (2, 7)**	0 (0, 5)	3 (1, 6)	12 (5, 25)[a]	4 (1, 11)
Don't know	**9 (5, 13)**	2 (0, 9)	3 (1, 7)	2 (0, 11)	13 (7, 22)

Do any food and beverage concessions operate on your airport's property, whether airport-owned/operated or non-airport owned/operated?

	Estimated percentage (lower bound, upper bound)				
Response	Total	Small hub	Non-hub	Non-primary commercial service	General aviation/reliever
Yes	**21 (18, 23)**	98 (91, 100)	80 (74, 86)	41 (39, 43)	13 (10, 15)
No	**79 (77, 82)**	2 (0, 9)	20 (14, 26)	59 (57, 61)	87 (85, 90)

A. **If yes, if known, how would you describe the overall impact COVID-19 has had on this business?**
(If more than one business of this type is operating at your airport, please report the overall impact on these businesses at your airport.)

	Estimated percentage (lower bound, upper bound)				
Response	Total	Small hub	Non-hub	Non-primary commercial service	General aviation/reliever
Very moderately/ negative	**89 (84, 93)**	98 (91, 100)	94 (89, 97)	88 (69, 97)[a]	85 (75, 93)[a]
Slightly negative	**7 (4, 11)**	0 (0, 5)	6 (3, 11)	12 (3, 31)[a]	8 (3, 18)
No impact	**3 (1, 7)**	2 (0, 9)	0 (0, 2)	0 (0, 11)[a]	5 (1, 13)
Positive	**1 (0, 4)**	0 (0, 5)	0 (0, 2)	0 (0, 11)[a]	1 (0, 8)
Don't know	**0 (0, 1)**	0 (0, 5)	0 (0, 2)	0 (0, 11)[a]	0 (0, 4)

Do any gift and/or retail concessions operate on your airport's property, whether airport-owned/operated or non-airport owned/operated?

	Estimated percentage (lower bound, upper bound)				
Response	Total	Small hub	Non-hub	Non-primary commercial service	General aviation/reliever
Yes	**9 (7, 11)**	100 (95, 100)	39 (36, 41)	3 (0, 11)	4 (2, 6)
No	**91 (89, 93)**	0 (0, 5)	61 (59, 64)	97 (89, 100)	96 (94, 98)

A. **If yes, if known, how would you describe the overall impact COVID-19 has had on this business?**
(If more than one business of this type is operating at your airport, please report the overall impact on these businesses at your airport.)

	Estimated percentage (lower bound, upper bound)				
Response	Total	Small hub	Non-hub	Non-primary commercial service	General aviation/reliever
Negative	**92 (82, 97)**	100 (95, 100)	100 (96, 100)	DNR	DNR
No impact	**4 (1, 12)**	0 (0, 5)	0 (0, 4)	DNR	DNR
Positive	**2 (0, 9)**	0 (0, 5)	0 (0, 4)	DNR	DNR
Don't know	**2 (0, 11)**	0 (0, 5)	0 (0, 4)	DNR	DNR

Do any other aviation-related businesses operate on your airport's property, whether airport-owned/operated or non-airport owned/operated?

	Estimated percentage (lower bound, upper bound)				
Response	Total	Small hub	Non-hub	Non-primary commercial service	General aviation/reliever
Yes	**34 (31, 37)**	56 (52, 59)	35 (33, 38)	38 (36, 41)	33 (30, 37)
No	**66 (63, 69)**	44 (41, 48)	65 (62, 67)	62 (59, 64)	67 (63, 70)

A. **If yes, if known, how would you describe the overall impact COVID-19 has had on this business?**
(If more than one business of this type is operating at your airport, please report the overall impact on these businesses at your airport.)

	Estimated percentage (lower bound, upper bound)				
Response	Total	Small hub	Non-hub	Non-primary commercial service	General aviation/reliever
Negative	**54 (48, 60)**	70 (51, 84)[a]	61 (56, 65)	DNR	53 (47, 60)
No impact	**26 (21, 31)**	6 (1, 20)[a]	17 (9, 29)[a]	DNR	27 (21, 33)
Positive	**7 (4, 11)**	12 (3, 28)[a]	11 (5, 22)[a]	DNR	6 (3, 11)
Don't know	**13 (9, 18)**	12 (3, 28)[a]	11 (5, 21)[a]	9 (1, 28)[a]	13 (9, 19)

Have you provided any rent or other rent relief to any of the tenants operating at your airport?

	Estimated percentage (lower bound, upper bound)				
Response	Total	Small hub	Non-hub	Non-primary commercial service	General aviation/reliever
Yes	**23 (21, 26)**	81 (69, 90)[a]	78 (76, 80)	44 (42, 47)	16 (13, 19)
No	**77 (74, 79)**	19 (10, 31)[a]	22 (20, 24)	56 (53, 58)	84 (81, 87)

A. If yes, please describe the type of relief you have provided to tenants.

Identified relief measures	Number of responses
Deferred payments (airports provided relief to tenants by not holding tenants to payment deadlines for a period of time, allowing them to catch up on what they owed later on (by a specified future date)	152
Waived payments (airports provided relief to tenants by providing abatement/cancellation/waiver of rent, MAG, or fees for an amount of time)	117
Changed rates and/or agreements (reduced rates and fees, changed/adjusted leases and agreements, opted not to proceed with rate increases, etc.)	77
Other relief measures	26

Note: The above results are based on a content analysis of written responses. A total of 289 respondents provided a valid, written response to this question. Respondents may have mentioned more than one measure taken, therefore responses do not add up to 100 percent.

Have any of your tenant businesses defaulted on any rents?

	Estimated percentage (lower bound, upper bound)				
Response	Total	Small hub	Non-hub	Non-primary commercial service	General aviation/reliever
Yes	**10 (8, 12)**	27 (17, 40)[a]	30 (28, 33)	20 (11, 32)[a]	7 (5, 10)
No	**90 (88, 92)**	73 (60, 83)[a]	70 (67, 72)	80 (68, 89)[a]	93 (90, 95)

Has your airport received a CARES Act Airport Grant?

	Estimated percentage (lower bound, upper bound)				
Response	Total	Small hub	Non-hub	Non-primary commercial service	General aviation/reliever
Yes	**91 (88, 93)**	100 (95, 100)	100 (98, 100)	100 (95, 100)	89 (86, 92)
No	**9 (7, 12)**	0 (0, 5)	0 (0, 2)	0 (0, 5)	11 (8, 14)

A. If yes, as of October 2020, for what purposes have you used or do you intend to use the grant award?

Payroll/labor costs

	Estimated percentage (lower bound, upper bound)				
Response	Total	Small hub	Non-hub	Non-primary commercial service	General aviation/reliever
Checked	**47 (43, 50)**	85 (73, 93)[a]	82 (76, 87)	69 (56, 80)[a]	42 (37, 46)
Not checked	**53 (50, 57)**	15 (7, 27)[a]	18 (13, 24)	31 (20, 44)[a]	58 (54, 63)

Utilities

	Estimated percentage (lower bound, upper bound)				
Response	Total	Small hub	Non-hub	Non-primary commercial service	General aviation/reliever
Checked	**35 (31, 38)**	46 (42, 49)	60 (57, 62)	46 (44, 48)	32 (28, 35)
Not checked	**65 (62, 69)**	54 (51, 58)	40 (38, 43)	54 (52, 56)	68 (65, 72)

Debt Service

	Estimated percentage (lower bound, upper bound)				
Response	Total	Small hub	Non-hub	Non-primary commercial service	General aviation/reliever
Checked	**12 (10, 14)**	53 (49, 56)	34 (32, 37)	18 (9, 30)	8 (6, 11)
Not checked	**88 (86, 90)**	47 (44, 51)	66 (63, 68)	82 (70, 91)	92 (89, 94)

Equipment

	Estimated percentage (lower bound, upper bound)				
Response	Total	Small hub	Non-hub	Non-primary commercial service	General aviation/reliever
Checked	**22 (19, 25)**	10 (4, 21)[a]	35 (33, 38)	30 (19, 43)[a]	21 (18, 25)
Not checked	**78 (75, 81)**	90 (79, 96)[a]	65 (62, 67)	70 (57, 81)[a]	79 (75, 82)

B. If yes, in what ways did the CARES Act financial assistance and its implementation work well in supporting your airport?

Identified relief measures	Number of responses
Budget solvency (Relates to financial aspect of CARES. Responses may include combatting revenue loss, paying bills, debt covenant requirements, “stay in the black,” meeting payroll, etc.)	268
Maintain level of service and/or operations (Relates to CARES Act impact on airport operations. Responses may include kept doors open, rates and charges, maintenance projects, services/operations.)	235
Avoid layoffs (Relates to impact of CARES on airport employees. Responses include avoiding layoffs and/or furloughs, allowing employees to keep jobs, and impact on staffing.)	87
Support projects (Responses include comments that relate to infrastructure projects, 100% match.)	74
CARES Act was well distributed (Relates to how the process was implemented. Responses include comments that relate to the process being easy, expedited, and flexible.)	77

Note: The above results are based on a content analysis of written responses. A total of 594 respondents provided a valid, written response to this question. Respondents may have mentioned more than one measure taken, therefore responses do not add up to 100 percent.

Appendix III: GAO Contact and Staff Acknowledgments

GAO Contact

Heather Krause, (202) 512-2834 or krauseh@gao.gov

Staff Acknowledgments

In addition to the contact named above, Amy Abramowitz, Paul Aussendorf, Melissa Bodeau, Kim Bohnet, Jon Carver (Assistant Director), Gail Marnik, Josh Ormond, Justin Reed (Analyst-in-Charge), Gretchen Snoey, Larry Thomas, Elizabeth Wood, Sirin Yaemsiri, and April Yeaney made key contributions to this report.

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