Chapter 0. COVID-19 Analysis

0.1. Introduction

The 2020 Colorado Aviation System Plan (CASP) and 2020 Colorado Aviation Economic Impact Study (CEIS) were initiated in September 2018 with a scheduled completion of May 2020. However, in the first half of 2020, the novel coronavirus (referred to as COVID-19) pandemic caused significant impacts on the global economy, the aviation industry, and Colorado's airports. The Colorado Department of Transportation (CDOT) Division of Aeronautics determined that an additional analysis of the pandemic and its impacts on the aviation system was needed to provide additional context to readers of the CASP and CEIS.

It is important to note that the circumstances surrounding the COVID-19 pandemic have not necessarily changed the recommendations of the CASP but may alter the timing of CASP recommendations as stability in funding and resources is determined and recovery continues. Furthermore, the findings of the CEIS were based primarily on 2018 data and are therefore accurate, however, are not necessarily reflective of calendar year 2020 impacts. The CEIS is typically updated by the CDOT Division of Aeronautics approximately every five years and the pandemic's impact will be more fully understood at the time of the next study, which is anticipated to occur in the 2023 timeframe.

The resulting analysis is presented in the following sections:

- Overview of the COVID-19 Pandemic
- Aviation Industry Impact
- Impact of the Pandemic to Colorado Airports
- Potential Recovery Scenarios

0.2. Overview of the COVID-19 Pandemic

COVID-19 is an infectious disease caused by a strain of coronavirus called SARS-CoV-2. People infected with COVID-19 can experience mild to severe symptoms that primarily affect the respiratory system. Although most people infected by the virus experience mild to moderate symptoms, older adults and those with underlying health conditions appear to be at a higher risk of experiencing severe illness or death.[1] Symptoms usually appear between two and 14 days after exposure to the virus.[2] The virus is thought to be spread primarily through respiratory droplets produced when an infected person coughs or sneezes. As such, 'social distancing' has become a component of everyday life, as the Centers for Disease Control and Prevention (CDC) recommends that people remain more than six feet away from others, particularly when in public settings.[3]

[1] Centers for Disease Control and Prevention, (CDC). (June 2020). "Coronavirus Disease 2019 Basics." Available online at https://www.cdc.gov/coronavirus/2019-ncov/faq.html#Coronavirus-Disease-2019-Basics. (Accessed June 2020).
[2] Centers for Disease Control and Prevention. (May 2020). "Symptoms of Coronavirus." Available online at https://www.cdc.gov/coronavirus/2019-ncov/symptoms-testing/symptoms.html (Accessed June 2020).
[3] Ibid.

The outbreak of COVID-19 was first reported on December 31, 2019 in the city of Wuhan, Hubei Province, China and was first identified as a new strain of coronavirus on January 7, 2020. The first case of COVID-19 in the U.S. was reported in Washington State on January 21, while the first recorded COVID-19 related death in the U.S. occurred on February 29. The virus began to spread rapidly across the country in early March and the World Health Organization (WHO) declared the outbreak a pandemic on March 11. By March 27, there were more than 100,000 cases reported in the U.S., and on April 28, the U.S. became the first country in the world to surpass 1 million confirmed cases.[4] According to Johns Hopkins University, there are more than 1.841 million COVID-19 cases and 106,000 COVID-19 related deaths in the U.S., as well as 6.445 million total cases around the globe as of June 3, 2020.[5] Through the remainder of June and into early July, U.S. COVID-19 cases continue to increase at dramatic rates and there are no estimates of when the situation may be resolved.

The spread of COVID-19 has brought global travel to a standstill as travel advisories and bans have been issued around the globe. The White House issued the first travel restriction between China and the U.S. on January 31 and expanded the restrictions to Iran, Italy, and South Korea on February 29. By March 11, travel restrictions were announced between the U.S. and continental Europe. On March 18, the U.S. and Canada agreed to close the border for all non-essential travel. The following day, the U.S. State Department raised the global travel advisory to level four, warning against all international travel. As March progressed, dozens of states closed public schools and universities and issued stay-at-home orders that prohibited non-essential business or travel.[6] By mid-April 2020, 45 states had executed some form of quarantine or shelter-in-place orderwhile the remaining five states allowed individual counties and municipalities to impose their own restrictions.

The pandemic has devastated the global economy as millions of businesses around the globe were forced to shut down or severely limit operations because of public health orders and travel bans. The U.S. preliminarily reported that the nation's gross domestic product (GDP) declined 5.0 percent in the first quarter of 2020, the largest quarterly decline since the 2008 Global Financial Crisis. The decline was reflected in the stock market, as the Dow Jones Industrial Average plummeted more than 30 percent between February 14 and March 23, 2020. Furthermore, the Bureau of Labor Statistics reported that 20 million people lost their jobs in April, bringing the total number of unemployed Americans to more than 23 million, approximately 14.7 percent of the total workforce. Globally, it is estimated that trade volumes will decrease between 13 and 32 percent and the global GDP will decline 2.4 percent in 2020.[7] Although it is too early to understand the full scope of the economic impacts of the pandemic, it is clear that the effects will be significant and long-lasting.

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[4] Muccari, R., Chow, D., & Murphy, J. (May 2020). "Coronavirus timeline: Tracking the critical moments of COVID-19". Available online at https://www.nbcnews.com/health/health-news/coronavirus-timeline-tracking-critical-moments-covid-19-n1154341 (Accessed May 2020).
[5] Johns Hopkins University. (June 2020). "COVID-19 Dashboard by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University (JHU)." Available online at https://www.arcgis.com/apps/opsdashboard/index.html#/bda7594740fd40299423467b48e9ecf6. (Accessed June 2020)
[6] Muccari, R., Chow, D., & Murphy, J. (May 2020). "Coronavirus timeline: Tracking the critical moments of COVID-19". Available online at https://www.nbcnews.com/health/health-news/coronavirus-timeline-tracking-critical-moments-covid-19-n1154341 (Accessed May 2020).
[7] Congressional Research Service. (June 2020). Global "Economic Effects of COVID-19". Available online at https://fas.org/sgp/crs/row/R46270.pdf. (Accessed June 2020)

0.3. Aviation Industry Impact

The public health restrictions and travel bans resulting from the COVID-19 pandemic have effectively halted global travel and tourism. The United Nations World Tourism Organization (UNWTO) estimated that international tourism revenues would decline as much as 78 percent from the previous year, resulting in a loss of up to $1.17 trillion (U.S. dollars or USD) in 2020.[8] The reduction of travel has caused many airlines, airports, and aviation businesses, as well as other travel-related businesses and those that depend on visitors whether business or leisure, to experience considerable reductions in overall operations and revenues, greatly affecting the aviation industry as a whole. The specific impacts of the pandemic on airlines, airports, and aviation businesses are addressed below, along with the actions that have been taken by aviation stakeholders, elected officials and regulatory agencies such as Congress and the Federal Aviation Administration (FAA) to reduce such impacts.

0.3.1. Airlines

Nearly every airline around the globe has been affected by the pandemic. Given that COVID-19 is spread through primarily coughs and sneezes, passenger aircraft are considered to have a higher risk for virus transmission similar to other enclosed spaces. As the virus spreads around the globe, airline passenger traffic declined rapidly and has remained far below normal for several months. As such, scheduled airline passenger loads have reached record lows and have caused airlines to experience massive losses in revenues. The results have been severe and have caused airlines in the U.S. and around the world to take drastic measures to remain operational. Unfortunately, the impacts of the pandemic have been too great for some airline companies, as four airlines in the U.S. and 12 international airlines have declared bankruptcy to restructure or cease operations altogether since the beginning of the crisis.

0.3.1.1. Passenger Traffic

International passenger enplanements began to decrease in late February while U.S. domestic passenger volumes declined sharply in mid-March. Globally, passenger traffic has witnessed an unprecedented decline as the International Civil Aviation Organization (ICAO) has projected that total 2020 passenger traffic around the globe would decrease up to 62 percent from 2019 totals. If this prediction is accurate, the reduction in passenger traffic during the pandemic would be equal to or greater than the industry impacts of individual previous upsets such as the post-9/11 downturn and the 2008 Global Financial Crisis.

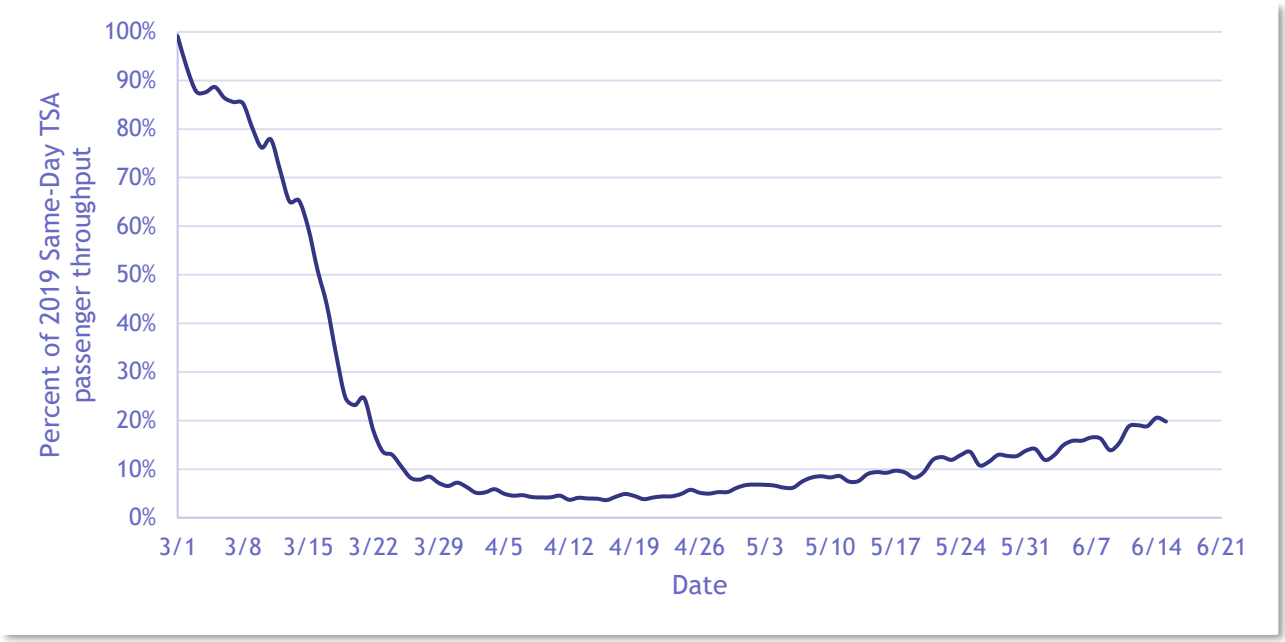
In the U.S., the Transportation Security Administration (TSA) publishes the daily number of passengers that are screened at commercial service airports across the country. The rapid decline in U.S. passenger traffic is illustrated in **Figure 0.1**, as passenger throughput decreased from 99.1 percent of the previous year's traffic on March 1, 2020 to 17.9 percent of the previous year's traffic just three weeks later on March 22. U.S. passenger traffic decreased to its lowest point on April 16, when the TSA screened only 95,085 passengers, approximately 3.6 percent of what the TSA had screened on the same

[8] International Civil Aviation Organization (ICAO). (June 2020). "Effects of Novel Coronavirus (COVID-19) on Civil Aviation: Economic Impact Analysis". Available online at: https://www.icao.int/sustainability/Documents/COVID-19/ICAO%20COVID%202020%2006%2008%20Economic%20Impact.pdf (Accessed June 2020)

day in 2019. As of June 15, passenger traffic had started to trend upwards and was nearing 20 percent of the 2019 throughput.[9]

The average number of passengers on each flight also decreased significantly as demand plummeted during the second quarter of 2020. According to Airlines for America (A4A), the average number of passengers per international flight on January 7, the day the virus was identified in China, was approximately 146 people, while domestic flights the same day carried an average of 98 passengers per flight. By the end of March, average passenger loads dropped to just 26 passengers per international flight and 12.5 passengers per domestic flight. As of June 15, passenger loads had rebounded slightly, as international flights and domestic flights carried an average of 58 and 61 passengers, respectively.[10]

Figure 0.1. 2020 vs. 2019 Same-day TSA Throughput Ratio



Source: Transportation Security Administration, June 2020

0.3.1.2. Revenues

The loss of passenger traffic has had a catastrophic impact on the airlines as ticket sales and fees represent the largest revenue stream for most passenger airlines. ICAO utilized a 2019 study that reported that the global airline industry including passenger and cargo airlines generated approximately $2.7 trillion USD in economic impact in 2016 as a baseline to estimate that airlines worldwide have lost approximately $130 billion USD between January and May 2020. In North America, meanwhile, passenger airlines have lost approximately $29 billion USD from January to May.

[9] Transportation Security Administration (TSA). (June 2020). "TSA checkpoint travel numbers for 2020 and 2019". Available online at: https://www.tsa.gov/coronavirus/passenger-throughput. (Accessed June 2020)
[10] Airlines for America (A4A). (June 2020) "Tracking the Impacts of COVID-19 - Update 76". Available online at: https://www.airlines.org/dataset/impact-of-covid19-data-updates/#. (accessed June 2020).

Additionally, nearly every major airline in the U.S. reported an operating loss in the first quarter and it is likely that this trend will continue when second quarter results are published.

However, the loss of airline revenues due to the pandemic was dampened slightly given strong growth in revenues during the first two months of 2020. Operating revenues of U.S. airlines grew more than 5 percent in January and February and revenues were trending towards setting a new record in 2020. Additionally, the price of JetA fuel plummeted to less than a dollar per gallon in early March, a 50 percent year-over-year decrease from 2019, providing some cost relief for airlines that had not previously hedged fuel. However, JetA prices have begun trending upwards since late May as fuel demand increased.

0.3.1.3. Airline Actions

Since March, airlines have taken a wide variety of actions to increase revenues, reduce costs, and minimize the overall impacts of the pandemic. The most notable change was the drastic reduction of capacity, as airlines around the globe parked aircraft in an effort to decrease operating expenses. In the U.S. alone, the number of idle aircraft increased from 316 on February 29 to 3,204 on May 18, more than 52 percent of the total U.S. airline fleet. Some airlines have opted to temporarily ground aircraft, parking them on unused runways, taxiways, and ramps; while other airlines have chosen to retire older aircraft and entire fleets---moving them to aircraft scrapyards around the country. Airlines have also deferred delivery of new aircraft and cancelled future aircraft orders altogether. As a result, the total number of available seat miles (ASMs) flown by U.S. airlines decreased more than 95 percent in April 2020. However, the decline in passenger traffic has continued to remain below the available capacity, resulting in low load factors and partially-filled aircraft.

Idle aircraft parked at Denver International Airport (Photo courtesy of Denver International Airport Facebook page)

Many airlines have also shifted operations away from scheduled passenger service towards specialized cargo operations. As stay-at-home orders were put in place around the world, global e-commerce activities increased and demand for air cargo surpassed demand for passenger travel. Commercial aircraft were also utilized to carry medical supplies, personal protective equipment (PPE), and personnel to regions that were most impacted by the pandemic. As a result, many airlines began operating cargo-only flights to generate additional revenue beyond normal passenger service. Additionally, some airlines retrofitted aircraft to carry cargo on their main decks through the use of specialized cargo nets and by removing seats from passenger aircraft altogether.[11]

[11] Horton, W. (April 2020). "American Airlines and United Fly More Cargo Flights Than Long-Haul Passenger Services" Available online at: https://www.forbes.com/sites/willhorton1/2020/04/21/american-airlines-and-united-fly-more-cargo-flights-than-long-haul-passenger-services/#163c83b8be6a. (Accessed June 2020).

Airlines have also taken significant actions to reduce staffing costs as they have implemented hiring freezes and cut non-essential employee spending. Many companies have also slashed executive compensation and implemented voluntary leave and early retirement programs in an effort to avoid employee layoffs and involuntary furloughs. Delta Air Lines alone had more than 41,000 employees take voluntary unpaid leave between March and June.[12] Furthermore, airlines that accepted funds from the Coronavirus Aid, Relief, and Economic Security Act (CARES Act) are required to maintain staffing levels and salaries until October 1, 2020. Several airlines have already made announcements about potential staffing cuts after October 1, with many offering voluntary separation programs. Most major airlines also made blanket requests for rent abatement or deferrals at commercial service airports. Additionally, many airline companies have negotiated with vendors including airports, regional airline partners, fuelers, caterers, and ground handlers to reduce operations and expenses.

For those passengers and aircraft still flying, the airline industry looks vastly different from what it did before the pandemic. Airlines have consolidated footprints at airports, closing lounges and ticket counters as well as halting real estate projects. Airlines have also introduced social distancing policies in airports and on-board aircraft, spreading out boarding queues and restricting passengers from booking or sitting in middle seats. Furthermore, airlines have implemented new cleaning policies for aircraft and terminal areas. Many airlines have required passengers to wear masks onboard aircraft and have limited in-flight service, only providing bottled water and prepackaged snacks to reduce contact between passengers and flight crew.

0.3.2. Airports

Many airports around the world have been similarly affected by the decline in passenger traffic caused by the pandemic. Airports have not only seen a decline in revenues from passenger travel, but have also experienced losses from other revenue streams and changes to operations. In response to the significant impacts of the pandemic, governments around the world have put in place laws and measures to support the struggling aviation industry. In the U.S., the Coronavirus Aid, Relief, and Economic Security Act (CARES Act) provided economic relief to millions of individuals and businesses, including airlines and airports. Additionally, the changes in revenue and government funding during the pandemic have had an impact on airports that are undergoing capital improvement projects.

0.3.2.1. Airport Revenues

Commercial service and general aviation (GA) airports alike have both fixed and variable revenue streams, but the way in which these revenues are generated varies between each airport. Variable revenue streams are usually tied directly to passenger and aircraft traffic levels at an airport, while fixed revenues remain constant regardless of the level of activity. Often times, large commercial service and GA airports rely on variable revenue streams by selling JetA and AvGas fuel, charging landing and parking fees for aircraft and automobiles, collecting passenger facility charges (PFCs) or customer facility charges (CFCs), or operating their own concessions and generating revenue directly from passenger sales. If they don't operate their own concessions, including fuel, they may get a percentage of the business's revenues, also a variable stream. Smaller airports that have less activity

[12] Delta Air Lines. (June 2020). "Business Update & Clean Experience" (Accessed June 2020).

usually rely more on fixed revenue streams including land leases to fixed-base operators (FBOs), flight schools, maintenance, repair and overhaul (MRO) shops, and other aviation businesses.

Given the variation in how airports generate revenues, the impacts of the pandemic on airports have differed greatly among different classifications of airports. It is still too early to quantify the specific impacts of the pandemic on GA and commercial service airports; however, trends are beginning to emerge in how airports are being impacted. Many international airports that rely on high levels of passenger and aircraft traffic have experienced massive revenue losses. Additionally, airports that have commercial service have experienced further loss in revenues as the airlines have requested rent deferrals and abatements. However, some airports that primarily rely on cargo or GA traffic have seen less significant negative impacts. Smaller airports with less activity that rely more on land and terminal leases to generate revenues have been impacted less than larger airports and in some cases, have seen no change whatsoever.

0.3.2.2. Operations

In addition to the loss of revenues, many airports have experienced changes to operations during the COVID-19 pandemic. As most airports are publicly owned, they are subject to state and local regulations regarding social distancing and closure of non-essential businesses. Given this, many airports introduced new policies including social distancing and face covering requirements, new cleaning procedures, and additional screening to determine if airport users have been exposed to or infected by COVID-19.

Although nearly every publicly owned airport in the U.S. has been considered an essential business that should remain open, certain facilities on airports have had to close, leading to drastic operational changes both in the air and on the ground. In late March, outbreaks of COVID-19 were reported at multiple air traffic control towers and air route traffic control centers, leading to the closure of the facilities. In turn, several airports and sections of airspace, most notably New York's John F. Kennedy International Airport, were forced to temporarily operate as uncontrolled airspace while controllers were tested and moved to backup facilities.[13] Airports have also had to close facilities in terminals including lounges, restaurants, and duty-free shops to remain in compliance with state and local ordinances. Additionally, some smaller GA airports have closed passenger terminals to the public altogether, only allowing incoming pilots and passengers to use basic amenities. Airports around the globe have also had to close portions of their airfields, including runway and taxiways, to provide space to park thousands of idle passenger aircraft.

0.3.2.3. CARES Act

On March 27, 2020, in consideration of the magnitude of the pandemic's impacts on airports and airlines, President Trump signed into law the Coronavirus Aid, Relief, and Economic Security Act (CARES Act or the Act). The CARES Act allotted $10 billion in funds to the FAA to disburse to provide economic relief to eligible airports affected by the pandemic. Furthermore, the FAA is using CARES Act

[13] Pallini, Thomas. (March 2020). "17 air traffic control centers have been temporarily closed after workers tested positive for coronavirus, highlighting a vulnerability in air travel". Available online at: https://www.businessinsider.com/coronavirus-airports-and-faa-centers-temporarily-closed-for-cleaning-2020-3. (Accessed June 2020)

funds to increase the federal share of Airport Improvement Program (AIP) and supplemental discretionary grants already planned for fiscal year 2020 to 100 percent.[14]

Additional funds are also being distributed to all airports that are part of the National Plan of Integrated Airport System (NPIAS). The amount of money each NPIAS airport received from the CARES Act was determined by a variety of formulas. For commercial service airports, 50 percent of the CARES Act funding allocation was determined by the airport's 2018 passenger enplanements number as a percentage of 2018 enplanements at all commercial service airports; while 25 percent of the total allocation was based on the airport's 2018 debt service as a percentage of total debt service at all commercial service airports; and the final 25 percent of the total allocation was based on the airport's 2018 ratio of unrestricted cash reserves to its respective 2018 debt service. The total allocation for GA airports was based on the aggregate published eligible development costs of each airport category in the 2019-2023 NPIAS Report. These allocated funds were then divided evenly across all airports in each category.[15]

More than $7.4 billion of the CARES Act funding allocated to airports can be used by airport sponsors for any lawful purpose pursuant to the FAA's Revenue Use Policy (64 Federal Register 7696). Many airports are using CARES Act funding to cover operating expenses, including staff payroll, in response to lost revenues while others are utilizing the funding to complete improvement projects. However, additional rules apply to the use of CARES Act funding. Funds from the CARES Act cannot be invested for future use or used to pay for projects that were initiated before the Act was passed, as the Act's purpose is to provide immediate economic relief to airports affected by the pandemic rather than to pay for airport improvement projects that would normally need a separate funding allocation. Additionally, any airport sponsor that accepts CARES Act funding must maintain employment for at least 90 percent of the individuals employed on March 27 through December 31, 2020. CARES Act funding is unique, however, as it does not carry the airport sponsor grant assurances that accompany standard grants, with the exception of assurances that prohibit discrimination against any specific aeronautical activity or individual based on their race, color, or national origin.[16]

0.3.2.4. Capital Improvement Projects

The pandemic has also had an immense impact on capital improvement projects at airports around the country. The Airport Consultants Council (ACC) conducted a survey of member companies in early April 2020 and found that more than 90 percent of companies had experienced delays or cancellations of projects, while 21 percent of companies had experienced severe delays.[17] The survey also identified trends in how projects were being affected. Most projects that were underway before the pandemic began are continuing, while projects that have completed the design phase but have not begun construction have been delayed and projects that have yet to be designed have been put on indefinite

[14] Federal Aviation Administration (FAA). (May 2020). "2020 CARES Act Grants". Available online at www.faa.gov/airports/cares_act/. (Accessed June 2020)
[15] FAA. (April 2020). "CARES Act Airport Grants – Frequently Asked Questions". (Accessed June 2020).
[16] FAA. (April 2020). "CARES Act Airport Grants – Frequently Asked Questions". (Accessed June 2020).
[17] Airport Consultants Council (ACC). (April 2020). "ACC Survey Identifies Initial Impacts from COVID-19 on Airport Development Projects". Available online at: https://www.aviationpros.com/airports/press-release/21133775/airport-consultants-council-acc-acc-survey-identifies-initial-impacts-from-covid19-on-airport-development-projects. (Accessed June 2020).

hold or canceled outright. However, some on-going projects have also experienced delays as engineering and construction staff at airports and consulting firms were forced to work remotely depending on state and local orders regarding essential worker definitions. Additionally, supply chain disruption has delayed projects as work crews wait for materials and equipment.[18]

Funding interruptions have also had a profound impact on capital improvement projects around the country. Although the CARES Act provided relief on federally funded projects, many local and state funding agencies have had to suspend grant appropriations. Several state aviation agencies, including Colorado, have reported a decline in aviation activity and are projecting a decline in state aviation revenues or funds.[19] As such, many state and locally funded improvement projects around the country have also been put on hold pending securing funding.

The decline in air traffic has proved beneficial for some airports. While commercial passenger airliners are parked on runways rather than arriving and departing from them, some airport sponsors are conducting pavement maintenance projects and accelerating other airport improvement projects. Additionally, the infusion of 100 percent AIP funds from the CARES Act has allowed airports to advance projects in their capital improvement program (CIP) since AIP grants for Fiscal Year 2020 did not require local funds.

0.3.3. Aviation Businesses

In addition to airports and airlines, many aviation businesses have been impacted by the COVID-19 pandemic. The most common businesses on airports, excluding airline companies, often are FBOs, flight schools, and Maintenance, Repair and Overhaul shops, although there are many other businesses depending on the airport. Similar to airports, aviation businesses generate revenue in a variety of ways, and, as a result, have been impacted differently by the pandemic. Additionally, certain businesses have been restricted by state and local stay-at-home orders, causing further financial and operational disruptions.

0.3.3.1. Fixed-Base Operators (FBOs)

FBOs handle many transient aircraft and passengers and often serve GA users including businesses and leisure users. As such, FBOs are highly dependent on high levels of activity to generate revenues to pay expenses, including staff. However, given that FBOs are the first point of contact at many airports, they are at a higher risk for virus transmission between air travelers and airport workers. The pandemic has had an immense impact on FBOs, as the number of GA flights around the world decreased by approximately 67 percent in April 2020 compared to the year prior.[20] Furthermore, FBOs often sell JetA and AvGas fuel to both transient and local traffic and have been affected by the decrease in fuel sales that has occurred around the globe. Additionally, some aircraft have been parked long-term on FBO ramps because of international travel restrictions, taking up space and draining resources. As a result,

[18] Ibid.
[19] National Business Aviation Association (NBAA). (April 2020). "State Aviation Officials See Wide-Ranging Impact of COVID-19". Available online at https://nbaa.org/aircraft-operations/safety/coronavirus/covid-19-point-of-impact/state-aviation-officials-see-wide-ranging-impact-of-covid-19/. (Accessed June 2020).
[20] ARGUS. (June 2020). "COVID-19'S Impact on Business Aviation". Available online at: https://www.argus.aero/covid-19-impact-business-aviation-activity/ (Accessed June 2020).

many FBO managers around the country have had to reduce staffing, cut operating hours, or limit services provided to customers in response to the loss of activity.[21] In response, many FBO operators, including national chains such as Signature Flight Support and Atlantic Aviation, have implemented new facility cleaning and aircraft handling procedures and have introduced rules and face covering requirements for travelers using their facilities.

0.3.3.2. Flight Schools

Flight schools and aviation training programs are the backbone of workforce development and are needed for active pilots to remain in compliance with FAA regulations, while also training the next generation of pilots and aviation professionals. Most flight schools have been deemed essential by state and local entities, however, two states, Virginia and Colorado, implemented stay-at-home orders that restricted flight training. These restrictions initially limited flight schools from conducting elective flight training of any form except to maintain currency; these restrictions have since expired.[22] Many flight schools and aviation education programs have opted to shut down amid concerns of virus transmissions. The flight schools that have remained open during the pandemic have drastically changed their operating procedures to limit potential exposure between students, instructors, and ground handlers. As it is nearly impossible to maintain social distancing in most flight training aircraft, some flight schools have halted dual flight instruction while others started conducting pre- and post-flight briefings over the phone, required face masks or have closed FBOs or flight training offices. Furthermore, flight schools have focused on cleaning aircraft interiors and inspection points between every user to minimize transmission risk.[23]

To alleviate the strain on pilots and flight training programs, the FAA has granted regulatory relief for pilots and flight schools who are unable to comply with standard requirements for FAA certificate holders including commercial and recreational pilots or drone operators. This relief order applies to all pilots fulfilling recency-of-experience or duration requirements as well as training for specialized certificate holders such as air ambulance operators. Additionally, the FAA has extended the validity of medical certificates in an effort to reduce the strain on medical professionals and examiners.[24] The actions of both flight schools and the FAA are significant in the aviation industry's efforts to minimize long term disruptions that could cause workforce shortage once the industry recovers.

0.3.3.3. Aircraft Maintenance Repair and Overhaul (MRO) Companies

MRO companies are vital to the overall safe operation of aircraft, whether GA or commercial. As aviation maintenance requirements are primarily dictated by FAA regulations, MROs are less dependent on aircraft traffic volumes at airports. As such, MROs have experienced less significant impacts compared to other aviation businesses. The National Business Aviation Association (NBAA) reported that

[21] NBAA. (April 2020). "FBOs 'Feel the Pinch' of COVID-19". Available online at: https://nbaa.org/aircraft-operations/safety/coronavirus/covid-19-point-of-impact/fbos-feel-the-pinch-of-covid-19-crisis/ (Accessed June 2020).
[22] Aircraft Owners and Pilots Association (AOPA). (June 2020). "COVID-19 State by State". Available online at: https://pic.aopa.org/blogs/70. (Accessed June 2020)
[23] Tallman, J. (May 2020). "What's Happening on the Front Lines of Flight Instruction" Available online at: https://www.aopa.org/training-and-safety/flight-schools/flight-school-business/newsletter/2020/may/11/flight-schools-and-covid-19. (Accessed June 2020).
[24] FAA. (May 2020). "Novel Coronavirus (COVID-19) Updates". Available online at: https://www.faa.gov/news/updates/?newsId=94991. (Accessed June 2020).

many MROs have seen a decline in discretionary maintenance such as paint and interior work, but other maintenance and repair work has continued as normal. However, there have been some disruptions in the supply chain of aircraft parts which has led to some adverse impacts for MRO operators, but it is not a widespread problem.[25] Often times, required aircraft maintenance and inspections are based on calendar and flight requirements, such as annual inspections and 100-hour inspections. Given this, MROs are continuing to maintain aircraft and are poised to serve aircraft users as the recovery from the pandemic begins.

0.3.3.4. Rental Car Companies

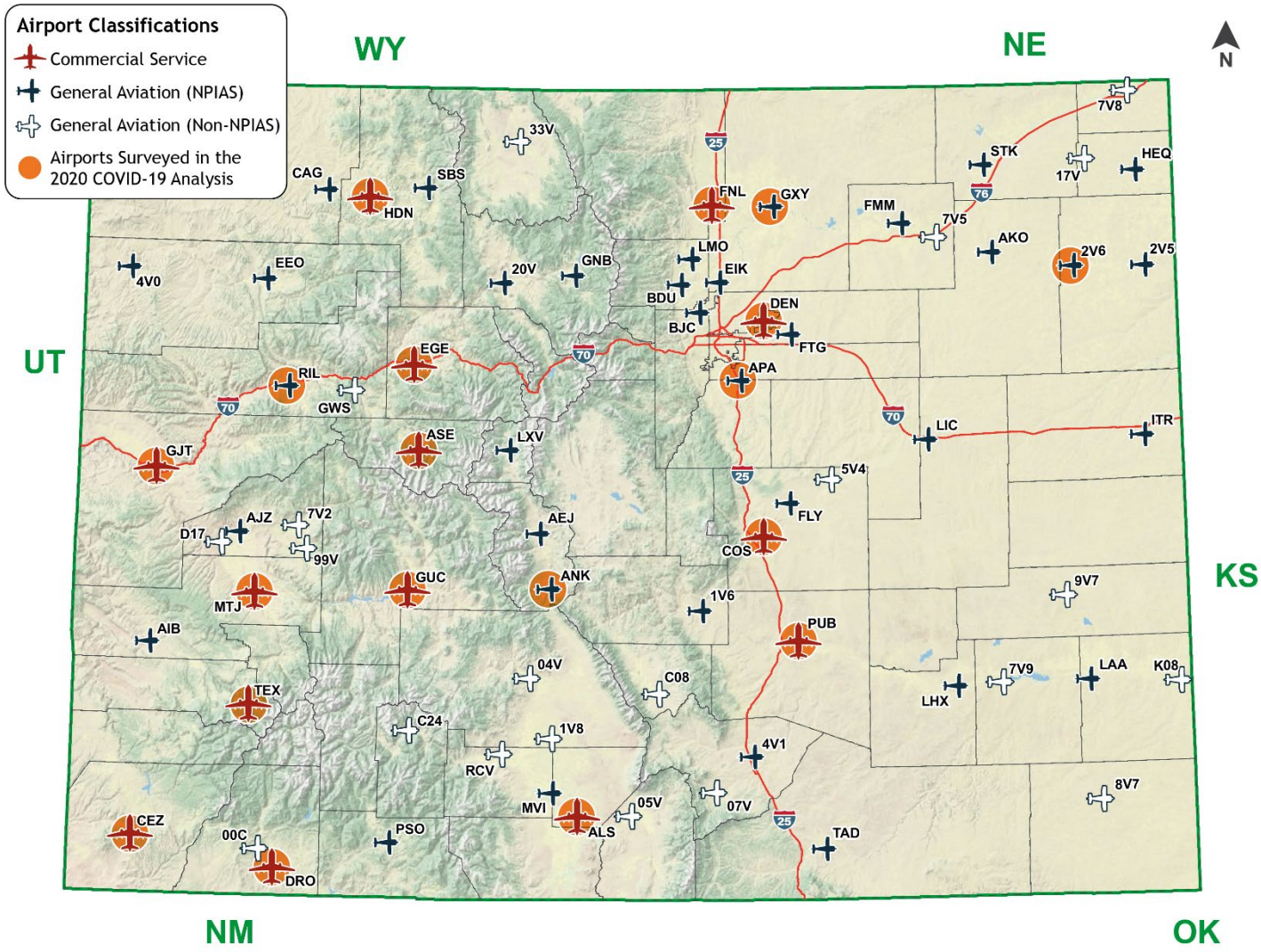
Although they are not normally considered aviation businesses, rental car companies are often located at airports and rely heavily on air passengers and airport activity. As such, rental car operations have experienced profound negative impacts that were already down due to transportation network carriers (TNCs) such as Uber and Lyft. Hertz, the rental car company that is also in the same umbrella as Dollar, Thrifty, and Firefly brands filed for bankruptcy on May 22 with the purpose of restructuring debts and remaining in business.[26] Avis Budget has cut its vehicle purchasing plans by more than 80 percent in 2020 as a response to the downturn. Both companies have already slashed their fleets, selling more than 76,000 cars in the U.S. in March alone. The financial struggles of rental car operators have already created a ripple effect in both directions, as airports have lost revenues from rental car fees and the used-car market has been flooded with inventory, driving down prices for auto manufacturers.[27] Many airports had also built consolidated rental car facilities in recent years which is also hurting airports' financial conditions.

0.4. Impact of Pandemic to Colorado Airports

Like many of their counterparts around the globe, a large proportion of Colorado's 74 public-use airports have been impacted in some way by the COVID-19 pandemic. Given this, CDOT felt that it was important to document these impacts to provide context to the 2020 CASP and CEIS as both studies were completed using 2018 data. Nineteen airports were selected to participate in a series of phone interviews to identify the qualitative and quantitative effects of the pandemic. The group of airports included all 14 commercial serve airports in the state as well as five GA airports that were selected based on a combination of factors including their level of activity and geographic location. The location of each surveyed airport is shown in **Figure 0.2.**

[25] NBAA. (April 2020). "MROs Work to Keep Aircraft Ready for Service During Pandemic". Available online at: https://nbaa.org/aircraft-operations/safety/coronavirus/covid-19-point-of-impact/mros-work-to-keep-aircraft-ready-for-service-during-pandemic/. (Accessed June 2020).
[26] Isidore, C. (May 2020). "Hertz Files for Bankruptcy". Available online at: https://www.cnn.com/2020/05/22/business/hertz-bankruptcy/index.html. (Accessed June 2020).
[27] [27] Isidore, C. (May 2020). "The rental car industry has ground to a near halt. This is what that means for automakers and car buyers". Available online at: https://www.cnn.com/2020/05/23/business/hertz-avis-budget-enterprise-covid-19-crisis/index.html

Figure 0.2. Airports Surveyed as part of the 2020 COVID-19 Postscript Analysis



Source: Kimley-Horn, 2020

0.4.1. Data Collection Process

In order to gather data from the 19 selected airports, a questionnaire was developed to identify the effects of the pandemic. The questionnaire was then used to guide phone interviews between the project team and airport managers and staff members, as well as CDOT Division of Aeronautics representatives. These calls were completed from late May to early June 2020, which provided enough time for airports to gather at least a full month's worth of data after the pandemic began. Each airport manager was asked to give a rating of the overall impacts of the pandemic, while certain topics were broken out to more closely analyze specific impacts. These topics included impacts to airport revenues, operational activity, funding, capital improvement projects, and staffing. Additionally, the questionnaire discussed impacts to business tenants on each airport, specifically regarding the need for lease abatements as well as changes to tenants' capital improvement programs and operational staffing. The final portion of the questionnaire asked airport managers to provide any available information regarding potential recovery scenarios, which is discussed in **Section 0.5**

0.4.2. Colorado COVID-19 Pandemic Timeline and Response

It is important to consider how the State of Colorado has been affected and has attempted to control the spread of the pandemic as it provides regional-specific context to the analysis. The first case of COVID-19 in Colorado was reported on March 5 by Governor Jared Polis. Less than a week later, the University of Colorado, University of Denver, and Colorado State University announced that all classes would be transitioned to online and their campuses would be closing. On March 14, Governor Polis announced the requirement for closure of downhill ski resorts, and two days later, on March 16, the required closure of all bars and restaurants in the state. March 18 and 19 saw the closure of all public schools and the federal government granting the state a disaster declaration, releasing relief funds to businesses across the state. Finally, on March 25, Governor Polis announced a state-wide stay-at-home order after confirmed cases exceeded 1,000.[28]

Colorado's stay-at-home order asked most of the state's 5.8 million residents to remain at home when not completing essential tasks such as grocery shopping, picking up medications, doing laundry, or participating in outdoor recreational activities such as walking or hiking. All businesses and government functions that were deemed 'nonessential' by the order were ordered to close on March 26 to prevent the spread of the virus. For those businesses that remained open, social distancing was required and in-person capacity was limited.[29] Essential businesses included grocery stores, health care providers, financial institutions, childcare facilities, liquor stores, firearm distributors, and homeless shelters. Additionally, all airports in the state were deemed essential, and some non-essential businesses on airports, including restaurants, were granted exceptions. However, certain limitations were imposed on flight training activities, as flight schools could only provide instruction for military purposes and pilot

[28] Denton, R. and Fries, T. (June 2020). "Coronavirus timeline: An in-depth look at COVID-19 in Colorado". Available online at: https://www.denverpost.com/2020/04/08/colorado-coronavirus-covid-timeline/. (Accessed June 2020).
[29] Tabachnik, S. and Burness, A. (May 2020). "Gov. Jared Polis orders Colorado to stay home in bid to slow coronavirus outbreak" Available online at: https://www.denverpost.com/2020/03/25/colorado-stay-at-home-coronavirus-polis/. (Accessed June 2020).

proficiency requirements. As such, elective flight training was not permitted, and as a result, many flight schools around the state shut down for the duration of the order.[30]

The stay-at-home order was originally set to expire on April 11, however, on April 6, amid rising cases, Governor Polis extended the mandate until April 26. On April 27, the state transitioned to a 'Safer at Home' mandate, which provided guidelines for a phased reopening. Beginning with the reopening of retail stores, the phased reopening has extended to salons, tattoo shops, personal trainers, and eventually limited dine-in at restaurants and bars. However, five counties in the Denver metro area extended local stay-at-home orders until May 8.[31] The 'Safer at Home' guidance has continued through June, although as of June 16, Governor Polis announced the 'Protect Your Neighbor' guidance that allowed some counties to reopen larger facilities and host events of up to 500 people if they met certain benchmarks related to transmission rates and testing capabilities.[32] However, after the number of daily new cases began to increase in late June and early July, Governor Polis announced a statewide requirement for masks to be worn at all times in public settings on July 16.[33]

0.4.3. Overall Airport Impacts

Each airport manager was asked to give an overall impact rating using a one to 10 scale, with one representing the least significant impacts and 10 representing the most. To provide a more comprehensive analysis, airports were asked to take all aspects of the pandemic's impacts into account when giving this rating, including impacts to airport revenues, activities, operations, and funding.

Colorado Springs Municipal (COS), Centennial (APA), and Montrose Regional (MTJ) reported the highest rating of nine, while Yuma Municipal (2V6) reported the least impacts with an overall rating of one. The overall impact ratings mostly reflected the overall levels of activity at each airport, as many of the larger GA and commercial service airports in the state reported higher overall ratings (airport activity is discussed further in **CASP Chapter 2. *Inventory of System Condition***). Additionally, on average, commercial service airports reported having more significant impacts than GA airports. However, there are a few exceptions. Most notably, Denver International Airport (DEN), which is highly dependent on revenues from passenger and cargo airlines, reported an overall impact of five, which was lower than three GA airports and all but one of the commercial service airports surveyed. DEN cited a well-built contingency plan, a large cash reserve, and a high level of coordination with airlines as the reasons for the lower overall impact rating. Additionally, multiple airports including Cortez Municipal (CEZ) and Rifle Garfield County (RIL) reported that funding provided by the CARES Act reduced the overall impacts of the crisis and therefore lowered each airport's rating.

The rating of the overall impact of the pandemic on each survey airport is reflected in **Table 0.1.**

[30] Aircraft Owners and Pilots Association (AOPA). (June 2020). "COVID-19 State by State-Colorado". Available online at: https://pic.aopa.org/blogs/70/36. (Accessed June 2020)
[31] Tabachik, S. and Swanson, C. (April 2020). "From caution to defiance, Colorado counties differ on whether to accept shift to "safer at home"". Available online at: https://www.denverpost.com/2020/04/25/coronavirus-covid-stay-at-home-orders/. (Accessed June 2020).
[32] Denton, R. and Fries, T. (June 2020). "Coronavirus timeline: An in-depth look at COVID-19 in Colorado". Available online at: https://www.denverpost.com/2020/04/08/colorado-coronavirus-covid-timeline/. (Accessed June 2020).
[33] Colorado Department of Public Health & Environment. (July 2020). "Guidance for Wearing Masks". Avaialable online at: https://covid19.colorado.gov/mask-guidance. (accessed July 2020).

Table 0.1. Overall Impacts

Associated City	Airport Name	FAA ID	Overall Impact Rating (1-10 Scale)
Alamosa	San Luis Valley Regional	ALS	8
Aspen	Aspen-Pitkin County	ASE	8
Colorado Springs	Colorado Springs Municipal	COS	9
Cortez	Cortez Municipal	CEZ	6
Denver	Centennial	APA	9
Denver	Denver International	DEN	5
Durango	Durango-La Plata County	DRO	7
Eagle	Eagle County Regional	EGE	6
Fort Collins/Loveland	Northern Colorado Regional	FNL	7
Grand Junction	Grand Junction Regional	GJT	8
Greeley	Greeley-Weld County	GXY	4
Gunnison	Gunnison-Crested Butte Regional	GUC	7
Hayden	Yampa Valley	HDN	8
Montrose	Montrose Regional	MTJ	9
Pueblo	Pueblo Memorial	PUB	7
Rifle	Rifle Garfield County	RIL	5
Salida	Harriet Alexander Field	ANK	7
Telluride	Telluride Regional	TEX	4
Yuma	Yuma Municipal	2V6	1

Source: 2020 CASP COVID-19 Impacts to Colorado Airports Questionnaire Results, June 2020

0.4.4. Impacts to Airport Operations and Activities

Airports throughout the state have experienced operational changes during the pandemic, with some changes having a more significant effect than others. The 14 commercial service airports all reported some change in commercial airline operations or passenger traffic during the pandemic, with varying degrees of severity. Additionally, commercial service and GA airports alike have reported changes in both local and itinerant GA traffic, further affecting the airports' revenues, funding, and staffing capabilities.

Nearly every commercial service airport in the state experienced a decrease in commercial service flights operating each day during the pandemic. However, the magnitude of the reductions varied from airport to airport. For example, Pueblo Memorial (PUB), San Luis Valley Regional (ALS), and Cortez Municipal (CEZ) receive commercial service flights through the Essential Air Service (EAS) program, meaning that airline routes remained consistent with pre-pandemic schedules, although load factors and types of aircraft serving those routes changed. Conversely, Telluride Regional (TEX) reported that commercial service ceased altogether. Furthermore, several mountain airports reported that seasonal airline flights ended early, and summer schedules were reduced, leading to a decline at some airports of up to 95 percent in commercial activities.

For the commercial flights that continued, passenger load factors dropped to nearly zero and many aircraft were operated with little to no passengers on board. Six airports reported decreases in passenger enplanements of at least 25 percent, with Eagle County Regional (EGE) reporting a 98 percent decline from enplanement levels from the previous April, the largest decline of any airport.

Denver International (DEN), the busiest airport in the state, reported a reduction primarily in international service while domestic service experienced a less significant decrease. DEN usually receives several flights from international destinations, but during the period from April 1 to June 16, no international flights were operated. DEN cited a federal ban on international air travel from any commercial service airport excluding 15 airports classified as a special port of entry based on CDC staffing levels in each airport's respective community. The international travel ban began in March and was expected to last 30 days but has been repeatedly extended by the U.S. State Department and remains in place for travelers from Europe as of June 30. DEN reported that they have received interest from multiple European airlines that will resume scheduled international flights once the ban is lifted. DEN's first international service resumed July 16 with a Volaris flight to Mexico.

GA activities have also been harshly impacted by the pandemic, disrupting airports' revenue streams and staffing needs. Fuel sales at GA airports dropped as much as 90 percent during March, April, and May as itinerant activities and flight training effectively ceased. Pueblo Memorial (PUB) cited the decline in flight training as a principal reason for their decline in revenue as L3 Harris Doss Aviation, a military contract flight school, is the largest tenant at the airport. However, the airport noted that the decline in flight training correlated with a slight increase in transient business activity.

Additionally, airports around the state that have a large amount of business and corporate activities reported a significant drop-off in activities as many industries transitioned to a virtual work environment. Specifically, Aspen-Pitkin County (ASE), Centennial Airport (APA), and Rifle Garfield County (RIL) all cited the decline in business or chartered jet and turboprop traffic as a reason for the overall operational decline at their airports. April was most commonly reported as being the slowest month for business and corporate traffic before activity increased in May, raising operational counts for airports that serve large amounts of corporate traffic. Corporate traffic increased so much that on May 5, APA was reported to have been the busiest airport in the U.S. with more than 1,300 daily operations.

Table 0.2 presents the estimated average decline in fuel sales (flowage) between April and May 2020 at the 19 airports. The percentages represent a composite percentage of JetA and AvGas sales decreases as some airports did not provide individual percentages for each fuel type. Some airports did not provide specific data related to fuel flowage, rather, they used metrics such as passenger enplanements and aircraft operations to describe the changes in activities. The data that was not obtained from airports is noted as "N/P" for "not provided" in this analysis. Additionally, as Yuma Municipal (2V6) does not sell fuel to public users, this question was not relevant. These data are denoted as "N/A" for "not applicable".

Table 0.2. Impacts to Airport Fuel Sales

Associated City	Airport Name	FAA ID	Airport Reported Fuel Sales Decrease (April-May)
Alamosa	San Luis Valley Regional	ALS	45%
Aspen	Aspen-Pitkin County	ASE	45%
Colorado Springs	Colorado Springs Municipal	COS	N/P
Cortez	Cortez Municipal	CEZ	94%
Denver	Centennial	APA	90%
Denver	Denver International	DEN	N/P
Durango	Durango-La Plata County	DRO	48%
Eagle	Eagle County Regional	EGE	88%
Fort Collins/Loveland	Northern Colorado Regional	FNL	75%
Grand Junction	Grand Junction Regional	GJT	64%
Greeley	Greeley-Weld County	GXY	2%
Gunnison	Gunnison-Crested Butte Regional	GUC	34%
Hayden	Yampa Valley	HDN	28%
Montrose	Montrose Regional	MTJ	90%
Pueblo	Pueblo Memorial	PUB	N/P
Rifle	Rifle Garfield County	RIL	74%
Salida	Harriet Alexander Field	ANK	88%
Telluride	Telluride Regional	TEX	88%
Yuma	Yuma Municipal	2V6	N/A

Source: 2020 CASP COVID-19 Impacts to Colorado Airports Questionnaire Results, June 2020

0.4.5. Impacts to Airport Revenues

Colorado's airports rely on similar revenue streams as other airports around the U.S., and, as such, many have experienced changes in overall revenues. At the time that the data were collected, most airports had two months' worth of data from fuel sales, land leases, and other revenue streams to provide an account of the pandemic's impacts. Airports were also asked to identify when the decline in revenues began and when they were at their worst.

Eighteen of the surveyed airports reported experiencing a loss in revenues, while one, Yuma Municipal (2V6), reported no loss. Airports were asked to provide an estimation for the change in total revenues in 2020 compared to 2018. However, certain airports were unable to provide an estimate for the entire calendar year and therefore supplemented the information with data regarding monthly losses during the height of the pandemic or projections for monthly activity levels for the remainder of the year. These data were then compiled to create composite estimates for 2020 revenue losses. It is important to note that these projections do not reflect actual airport budgets and could change significantly. Furthermore, several airports noted that operating revenues had grown each year since 2018, so the revenue losses from 2018 reflect a smaller percentage decrease compared to actual losses from 2019 results.

Montrose Regional (MTJ) reported the largest projected revenue reduction of any commercial service airport, as it predicted a 40-60 percent loss from 2018 revenues. The airport noted that concessionaire sales and landing fees were affected the most when passenger traffic declined. Eagle County Regional (EGE) only expected a 13-16 percent loss, the least of any commercial service airport. However,

Gunnison-Crested Butte Regional (GUC) and Pueblo Memorial (PUB) did not provide projected losses because each facility lacked fuel sales and concessionaire data needed to provide analysis when the questionnaire was completed. Of the five surveyed GA airports, Centennial (APA) reported the largest projected impact with an estimated revenue loss of 11 percent. Three other GA airports reported a loss in revenues, and, of those, Harriet Alexander Field (ANK) and Greeley-Weld County (GXY) both reported an eight percent decline in projected revenues, the lowest loss reported.

Yuma Municipal (2V6) was unique in this portion of the survey as it reported no change in revenues and cited the absence of fuel sales at the airport as the reason for the lack of impacts. 2V6 also noted that aerial agricultural application is the most common activity at the airport and such activities have been largely unaffected. 2V6 stated that the only operational changes at the airport were a slight increase in medical supply and evacuation flights, as well as a new requirement for maintenance staff members to wear face masks while on the airfield.

Some airports identified specific dates when revenues and activities began to decline, often because of the loss of scheduled passenger service, while others identified a broader timeframe as activities slowly trailed off. Several mountain airports noted that the timing of the decline was fortuitous as late spring is often considered the offseason as ski resorts around the state close for the season. Airports also were asked to describe when the impacts of the pandemic were most severe, i.e., the low point in revenues and activities. Twelve airports reported the worst impacts in April, while the earliest bottoming-out was reported as the third week of March and the latest was reported as the first week of May.

Airports reported the low point based on a variety of metrics. For example, APA reported that fuel sales dropped as much as 90 percent during April compared to the year prior, while Grand Junction Regional (GJT) reported the low point in April when passenger levels declined 95 percent from the previous April's activities. However, not all airports identified a specific time frame when revenues and activities bottomed out, as Rifle Garfield County (RIL) reported their activity levels remained fairly constant after the initial decline.

Table 0.3 summarizes each surveyed airport's responses to questions related to estimated revenue losses, when the decline in revenue and operations began, and when revenues and activities reached their lowest point.

Table 0.3. Impacts to Airport Revenues

Associated City	Airport Name	FAA ID	Loss of Revenues (Y/N?)	Estimated Revenue Loss (2020 Vs. 2018)	When Did the Decline Start?	When Was the Decline in Revenues the Worst?
Alamosa	San Luis Valley Regional	ALS	Yes	45%	March 29	April
Aspen	Aspen-Pitkin County	ASE	Yes	42%	March 9	March 20
Colorado Springs	Colorado Springs Municipal	COS	Yes	43%	Mid-March	Mid-April
Cortez	Cortez Municipal	CEZ	Yes	40%	Mid-March	N/P
Denver	Centennial	APA	Yes	11%	Last 2 weeks of March	April
Denver	Denver International	DEN	Yes	25-30%	3rd week of March	April
Durango	Durango-La Plata County	DRO	Yes	39%	March 13	N/P
Eagle	Eagle County Regional	EGE	Yes	13-15%	March 22	April
Fort Collins/Loveland	Northern Colorado Regional	FNL	Yes	20%	Late March	Mid-April
Grand Junction	Grand Junction Regional	GJT	Yes	34%	March 10	April
Greeley	Greeley-Weld County	GXY	Yes	8%	End of March	April
Gunnison	Gunnison-Crested Butte Regional	GUC	Yes	N/P	March 11	April
Hayden	Yampa Valley	HDN	Yes	12%	March 15	Third week of March
Montrose	Montrose Regional	MTJ	Yes	40-60%	Mid -March	First week of May
Pueblo	Pueblo Memorial	PUB	Yes	N/P	Mid-March	April
Rifle	Rifle Garfield County	RIL	Yes	10%	March 13	Since March
Salida	Harriet Alexander Field	ANK	Yes	8%	Mid-March	April
Telluride	Telluride Regional	TEX	Yes	25%	March 15	April
Yuma	Yuma Municipal	2V6	No	0%	N/A	N/A

Source: 2020 CASP COVID-19 Impacts to Colorado Airports Questionnaire Results, June 2020

0.4.6. Impacts to Airport Funding and Staffing

The disruptions in activities and revenue streams at many Colorado airports created a chain reaction of effects in terms of airport funding and staffing. For this reason, airport managers were asked to discuss details regarding the use of their CARES Act funding, the effect of reduced CDOT fuel tax disbursements on the airport budget and planned capital improvement projects. Additionally, airports were asked to report any staffing changes in airport administrative, operational, or maintenance personnel.

The 49 NPIAS airports in Colorado's airport system received funding from the CARES Act, including all 19 airports surveyed in this analysis. Of the surveyed airports, Denver International (DEN) received the largest amount of funds ($269,073,999), while Yuma Municipal (2V6) received the smallest amount ($20,000). However, San Luis Valley Regional (ALS) received the smallest amount of any commercial service airport ($30,000). For this analysis, each airport was asked to identify how they planned to utilize the funding. Thirteen of the surveyed airports reported that the funding would be used to cover operating expenses, while two airports were planning on using the funds to cover debt service, and one planned on using the funds strictly for capital improvements. Three airports reported that the funds would be divided and partially used for capital projects and operating expenses. The impact of the funding also varied drastically between airports, as Centennial (APA) reported that the $157,000 of CARES Act funding received would cover one week's worth of operating expenses, while Grand Junction Regional (GJT) reported that the funding ($5,679,740) would cover debt service for three years.

In addition to federal funding, the analysis sought to determine the effects that a decline in state funding would have on airport's operating and capital improvement budgets. Since mid-March, CDOT has projected that revenues and fuel tax disbursements would decrease because of a reduction in fuel sales an overall decrease in flight activities. Therefore, airports were asked to discuss how the decline in CDOT fuel tax disbursements would affect the airport's overall budget. Unfortunately, at the time the data collection process was completed, most airports did not have fuel tax disbursement data from CDOT for the months of March or April, so a projection of total revenue losses could not be completed. However, airports did provide information about how much of their total budget is based on CDOT fuel tax disbursements, which provides needed context for the projection of possible revenue losses for the year. Centennial (APA) reported the largest dependency on the disbursements as they represent 16.7 percent of their annual budget, while 11 airports reported that the budgets accounted for less than five percent of their annual budget. As such, the impacts stemming from a loss in CDOT fuel tax disbursements are generally low, although all airports that receive disbursements indicated it is a revenue stream they greatly appreciate.

As a result of changes to several factors including airport funding, contractor capability, and material availability, airport capital improvement projects have been significantly impacted by the pandemic in both positive and negative ways. Thirteen surveyed airports reported that they had put capital projects on either a delay or indefinite hold. Of these, eight airports cited a lack of local funding as the reason for the delay, while one airport cited the inability to incur debt as the cause, and one cited the lack of available CDOT funding. The remaining three airports did not cite a specific reason for the delay. Of the six airports that reported having no delayed or suspended projects, several reported that they were

worried about future projects being delayed given the projected loss in state funding and local resources.

Some airports took advantage of the pandemic's impacts to complete improvement projects around the terminal or on the airfield ahead of schedule. Five surveyed airports reported that they had or are planning on moving improvement projects up because of the decline in activities. Airports cited the lack of passenger activities and the infusion of CARES Act funding as the reason for projects being completed early. Most notably, Denver International (DEN) reported that it had planned to complete a series of terminal revitalization projects over the course of 10 years to avoid passenger disruption, however, because of this time of depressed demand, the projects will now be complete in two to three years.

Airports were also asked to provide information regarding any staffing changes in each airport's administrative and maintenance staff. Fortunately, no airport has made permanent staffing changes, although Yampa Valley Regional (HDN) reported that seasonal staff members were released two weeks early after commercial service flights halted. However, two airports noted that their local municipality had imposed hiring freezes, which could cause temporary staffing shortages for the affected airports. Additionally, many airports asked staff to work from home to mitigate the spread of the virus while some offered paid leave to staff members unable to work from home.

Table 0.4 presents the responses of each airport's response to questions regarding airport funding and capital projects.

Table 0.4. Impacts to Airport Capital Funding and Project Progress

Associated City	Airport Name	FAA ID	How is the Airport Utilizing CARES Act Funding?	Has the Airport Put Any Projects on Delay or Indefinite Hold?	Has the Airport Expedited or Moved Any Projects Forward?
Alamosa	San Luis Valley Regional	ALS	Operating Expenses	Yes	No
Aspen	Aspen-Pitkin County	ASE	Operating Expenses	Yes	No
Colorado Springs	Colorado Springs Municipal	COS	Operating Expenses	Yes	Yes
Cortez	Cortez Municipal	CEZ	Operating Expenses	No	No
Denver	Centennial	APA	Operating Expenses	Yes	No
Denver	Denver International	DEN	Debt Service	Yes	Yes
Durango	Durango-La Plata County	DRO	Operating Expenses	Yes	No
Eagle	Eagle County Regional	EGE	Operating Expenses	Yes	No
Fort Collins/Loveland	Northern Colorado Regional	FNL	Capital Improvements	Yes	No

Associated City	Airport Name	FAA ID	How is the Airport Utilizing CARES Act Funding?	Has the Airport Put Any Projects on Delay or Indefinite Hold?	Has the Airport Expedited or Moved Any Projects Forward?
Grand Junction	Grand Junction Regional	GJT	Debt Service	Yes	Yes
Greeley	Greeley-Weld County	GXY	Operating Expenses	No	No
Gunnison	Gunnison-Crested Butte Regional	GUC	Operating Expenses/ Capital Improvements	Yes	Yes
Hayden	Yampa Valley	HDN	Operating Expenses/ Capital Improvements	No	Yes
Montrose	Montrose Regional	MTJ	Operating Expenses	Yes	No
Pueblo	Pueblo Memorial	PUB	Operating Expenses	No	No
Rifle	Rifle Garfield County	RIL	Operating Expenses	Yes	No
Salida	Harriet Alexander Field	ANK	Operating Expenses/ Capital Improvements	No	No
Telluride	Telluride Regional	TEX	Operating Expenses	No	No
Yuma	Yuma Municipal	2V6	Operating Expenses	No	No

Source: 2020 CASP COVID-19 Impacts to Colorado Airports Questionnaire Results, June 2020

0.4.7. Impacts to Tenant Funding and Staffing

Airport sponsors were not the only entities affected by the pandemic, as hundreds of airport business tenants around the state have been adversely affected by the decline in aviation activities. As discussed in **Section 0.3** aviation businesses of all sorts, including airlines, have experienced drastic impacts and have had to react accordingly in an effort to reduce costs and remain in business. Therefore, airport managers were asked to provide details about how the funding and staffing of business tenants were impacted. Additionally, airport managers were asked to discuss details regarding rent abatements or deferrals for on-airport businesses.

Unlike most airport improvement projects, tenant capital improvement projects must rely on internal funding to complete projects, and as such, many businesses have had to delay or suspend projects. Four airports reported that business tenants had to delay or cancel projects. Specifically, Montrose Regional (MTJ) reported that Rocky Mountain Turbines had put multiple projects on hold while Centennial (APA) reported that construction of a new large hangar development was deferred until 2021. Denver International (DEN) reported that rental car companies had delayed improvement projects and reported that the airport had suspended requirements for concessionaires to update

leased terminal spaces. Rifle Garfield County (RIL) reported that the Atlantic Aviation FBO had scrapped a project for a new hangar at the airport due to lack of funding. Of the airports that reported no changes to tenant improvement projects, several noted that this was because no tenants had planned projects. It is possible that business tenants at these airports could delay the planning of future projects until the industry shows signs of recovery.

Many business tenants have seen significant impacts to operational activities and revenues, and, as such, have had to make changes to staffing levels. Twelve airports reported changes in tenant staffing levels, however, two airports indicated that tenants had actually added employees. Airline companies appear to be heavily impacted, as six airports reported that airlines furloughed or laid off staff, while one airport reported that seasonal airline workers were released two weeks early. Additionally, eight airports reported that rental car companies had made staffing changes. Several airport managers also mentioned that Hertz was the rental car company at their airport, and, given this, they were uncertain of what operational and staffing changes would occur following the company's bankruptcy declaration. Other businesses that reported significant staffing changes include FBOs, restaurants, and MRO shops. Additionally, multiple airports allowed concessionaires to temporarily close to reduce operating costs and remain in business.

Fourteen of the surveyed airports, including two GA airports, reported that they were providing rent abatements or deferrals. In the context of this analysis, it is important to note that an abatement means that tenants are permanently relieved of responsibility to pay a portion or entirety of rent payments, while a deferral refers to rent payments that have been suspended temporarily but are expected to be paid to the airport at a later date. Of these airports, seven reported that tenants that requested relief were provided rent deferral for three months (usually April-June), while three airport managers reported that they were offering six-month deferrals (April-September). These airports all reported different requirements for rent repayment, including Gunnison-Crested Butte Regional (GUC), which reported a 90-day repayment period, and San Luis Valley Regional (ALS), which allowed tenants up to 12 months to repay deferred rent. Four airports reported that they were providing rent abatement to business tenants. These airports noted that the businesses that were granted abatement showed a reduction in revenues or, in some cases, were forced to close because of state or local restrictions.

Table 0.5 presents each airport manager's response to questions regarding the staffing and funding of business tenants, as well as their response to whether or not the airport was providing rent abatement or deferrals.

Table 0.5. Impacts to Tenant Staffing and Funding

Associated City	Airport Name	FAA ID	Have Business Tenants Made Staffing Changes?	Have Business Tenants Put Any Projects on Delay or Indefinite Hold?	Has the Airport Offered Rent Abatement or Deferrals to Business Tenants?
Alamosa	San Luis Valley Regional	ALS	No	No	Yes
Aspen	Aspen-Pitkin County	ASE	Yes	No	Yes

Associated City	Airport Name	FAA ID	Have Business Tenants Made Staffing Changes?	Have Business Tenants Put Any Projects on Delay or Indefinite Hold?	Has the Airport Offered Rent Abatement or Deferrals to Business Tenants?
Colorado Springs	Colorado Springs Municipal	COS	No	No	Yes
Cortez	Cortez Municipal	CEZ	Yes	No	No
Denver	Centennial	APA	Yes	Yes	No
Denver	Denver International	DEN	Yes	Yes	Yes
Durango	Durango-La Plata County	DRO	Yes	No	Yes
Eagle	Eagle County Regional	EGE	No	No	No
Fort Collins/Loveland	Northern Colorado Regional	FNL	No	No	Yes
Grand Junction	Grand Junction Regional	GJT	Yes	No	Yes
Greeley	Greeley-Weld County	GXY	Yes	No	Yes
Gunnison	Gunnison-Crested Butte Regional	GUC	No	No	Yes
Hayden	Yampa Valley	HDN	Yes	No	Yes
Montrose	Montrose Regional	MTJ	Yes	Yes	Yes
Pueblo	Pueblo Memorial	PUB	Yes	No	Yes
Rifle	Rifle Garfield County	RIL	Yes	Yes	Yes
Salida	Harriet Alexander Field	ANK	No	No	No
Telluride	Telluride Regional	TEX	Yes	No	Yes
Yuma	Yuma Municipal	2V6	No	No	No

Source: 2020 CASP COVID-19 Impacts to Colorado Airports Questionnaire Results, June 2020

0.5. Potential Recovery Scenarios

It is clear that the COVID-19 pandemic has had severe impacts on not only Colorado's airports but the global aviation industry and overall economy. As such, thousands of government agencies, companies, and industry organizations have developed scenarios or models to predict how select industries or the global economy will recover from the economic downturn caused by the pandemic. This analysis provides a high-level overview and discussion of possible recovery scenarios and recovery timelines for the aviation industry and compares these results with the reported recovery plans of the 19 Colorado airports. Additionally, scenarios were developed to illustrate how changes to passenger traffic could possibly affect the overall economic activity level of the Colorado airport system compared to the findings of the 2020 CEIS. Finally, potential long-term changes are discussed as the aviation industry shifts its operating and planning procedures to meet the public's needs and desires.

0.5.1. Aviation Industry Recovery Scenarios

Aviation industry organizations have created scenarios using data and insight from airlines, airports, government agencies as well as information from previous economic downturns such as 9/11, SARS, and the 2008 Global Financial Crisis. However, the pandemic is far from over and the circumstances

surrounding the pandemic remain highly volatile, meaning that there are countless ways that the situation could play out. As such, all recovery scenarios presented have taken significant assumptions and should be regarded accordingly.

Table 0.6 presents a series of potential recovery scenarios developed in April by Inter*VISTAS*, an international aviation consulting firm that provided data for Airlines for America's analysis of the pandemic. These scenarios consider several factors including global travel restrictions, global case counts, and regional differences in how public officials are attempting to control the spread of the outbreak.

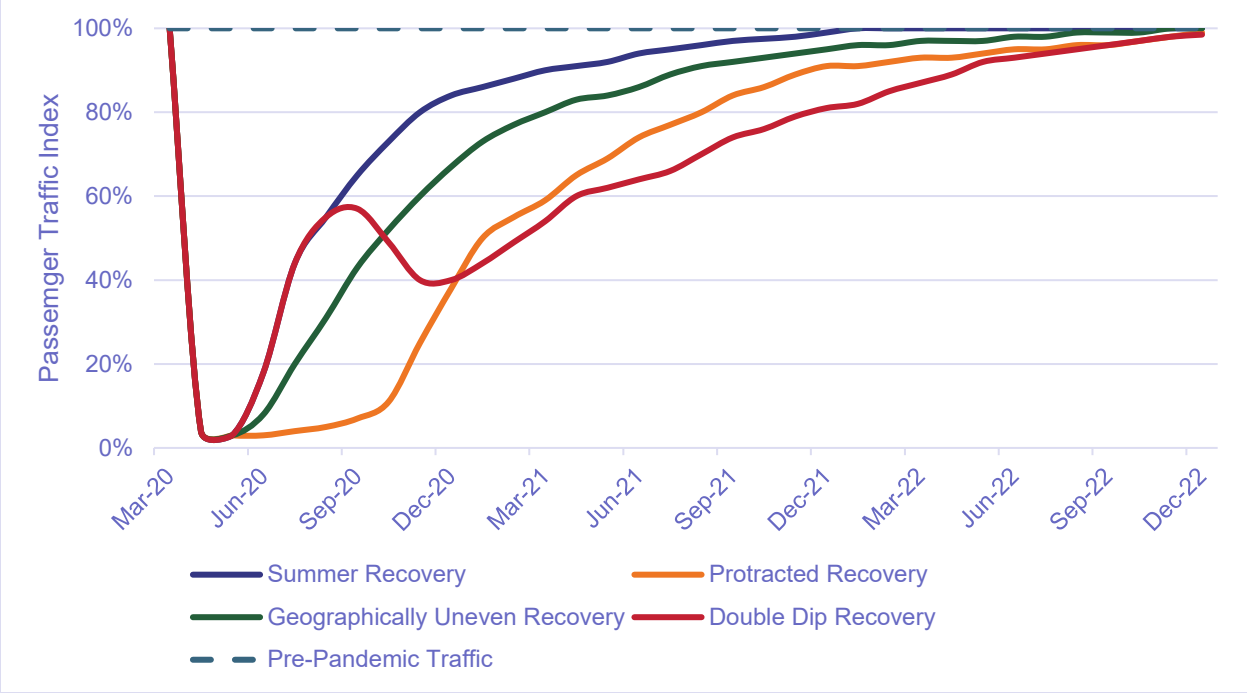
Table 0.6. Potential Recovery Scenarios

Recovery Scenario	Description	Recovery Timeline
Summer	Global travel restrictions start to be lifted in June and passenger traffic rapidly increases at the end of summer 2020	38 percent of passenger traffic lost in 2020, full recovery in mid to late 2021
Protracted	Global travel restrictions remain in place until September 2020 due to viral flare-ups, traffic increases more slowly than summer recovery	73 percent of passenger traffic lost in 2020, full recovery in late 2022 or 2023
Geographically Uneven	Some parts of the world control virus outbreak and lift travel restrictions while others do not, enabling domestic air travel in different regions. The global economy will recover more quickly than protracted recovery, with some regions lagging behind	59 percent of passenger traffic lost in 2020, full recovery in mid to late 2022
Double Dip	Global restrictions are lifted in the summer, but a second wave of the virus causes a decline but not a total lockdown	52 percent of passenger traffic lost in 2020, full recovery late 2022

Source: InterVISTAS, April 2020

Each scenario provides a different timeline of when the global aviation industry will recover from the recession caused by the pandemic. For the purpose of the analysis, full recovery indicates that passenger traffic levels have returned to the level reported before the pandemic began, although this level is still below previously forecasted levels of activity based on industry growth. **Figure 0.3** illustrates the timeline of each recovery scenario by measuring total passenger traffic as a percentage of pre-pandemic traffic levels.

Figure 0.3. Potential Recovery Timelines



Source: InterVISTAS, April 2020

These scenarios were developed in April 2020 and, given that the situation has evolved in the months following, the probability of certain scenarios has changed. For example, the initial scenario of a summer recovery seems less probable because as of June 20, 2020, global infection rates of the virus were still increasing.[34] It appears that the 'Protracted' or 'Geographically Uneven' recovery is the most probable scenario for the airline industry as very few travel restrictions have been lifted and passenger traffic has begun to increase. Furthermore, certain states or regions such as Australia and New Zealand appear to have slowed the spread of the virus, while other areas including Florida, Texas, and Arizona have recorded a record number of daily new cases during the first three weeks of June. As such, it is possible that regions with a low amount of cases will reopen to domestic travelers while remaining closed to international travelers that may have come from a region with high infection rates, following the 'Geographically Uneven' model. However, both the protracted and geographically uneven recovery scenarios are based on a single 'wave' of the virus spreading across the globe. If the pandemic experiences a 'second wave', a resurgence in areas already affected by the virus, as many epidemiologists have suggested, overall traffic may decline once more, and the industry recovery will follow the 'Double Dip' scenario. Given the volatility and the complexity of the situation surrounding the pandemic, it is highly probable that the actual recovery of the aviation industry will follow a path that includes elements of all four scenarios.

[34] Johns Hopkins University. (June 2020). "COVID-19 Dashboard by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University (JHU)." Available online at https://www.arcgis.com/apps/opsdashboard/index.html#/bda7594740fd40299423467b48e9ecf6. (Accessed June 2020)

ICAO has also developed a series of projections for the timeline and shape of the industry's recovery. These projections were developed in June and largely reflect the findings of Inter*VISTAS*, however, ICAO also provided monetary estimates for the total impacts of specific sectors of the aviation industry. ICAO calculated that the global airline industry generated approximately $2.7 trillion USD in economic impact in 2016 and was forecast to increase 110 percent by the year 2036. Using a conservative estimate similar to the 'Summer Recovery' scenario, the airline industry will experience an overall reduction of 2.29 million to 3.06 million passengers in 2020, resulting in an approximate loss of $302 to $400 billion USD in gross revenues. Additionally, ICAO estimates that airports will experience a loss of more than 50 percent of passengers, resulting in a loss of roughly $97 billion USD of airport revenues in 2020.[35]

To provide context for the impacts of the pandemic, it is crucial that they are compared to the impacts of other events such as 9/11 and the 2008 Global Financial Crisis. After the tragic events of the September 11 attacks, the aviation industry experienced a decline in demand and a downturn in the global economy, driving the industry into a recession that the industry did not recover from until the second quarter of 2004. In comparison, the 2008 Global Financial Crisis caused a decline in passenger demand and a significant increase in fuel prices, crippling the industry. It took the passenger airline industry more than six years to return to the 2008 passenger traffic levels, while the global air cargo industry took nearly 10 years to fully recover. Based on the scenarios presented above, it appears that the recovery from the pandemic will likely mirror the post-9/11 recovery process. However, the situation remains volatile and the recovery could play out differently than any scenario currently constructed.

0.5.1.1. *Colorado Airport Recovery Scenarios*

Colorado airports were also asked to provide an explanation of each airport sponsor's plan to weather the pandemic and to recover to normal operating and revenue levels. The scope and timeline of the recovery reported by each airport largely depended on the overall effects of the pandemic on the airport. For example, Centennial (APA) reported an overall impact rating of nine out of 10 and is planning on cutting operating expenses by 12.5 percent in 2020 and estimates that the recovery will take until 2023. 2V6 reported very minor impacts from the pandemic and has not implemented any structured recovery plan.

Many of the airport managers reported that their recovery projection was based largely on the projections of the aviation industry and the overall economy. In the meantime, most of the airports have been working on reducing operating expenses, canceling or delaying capital improvements, and operating with minimum staffing. Five airports projected that the recovery period would last two to four years, reflecting the predictions made by ICAO and Inter*VISTAS*. However, not all airport managers gave specific timelines for recovery, rather they provided details of the operational changes that may be made during the recovery. These changes include Colorado Springs Municipal (COS) increasing advertising to stimulate demand, San Luis Valley Regional (ALS) working with tenants to gather passenger enplanement data for future FAA funding, and Greeley-Weld County (GXY) potentially leasing

[35] ICAO. (June 2020). "Effects of Novel Coronavirus (COVID-19) on Civil Aviation: Economic Impact Analysis". Available online at: https://www.icao.int/sustainability/Documents/COVID-19/ICAO%20COVID%202020%2006%2008%20Economic%20Impact.pdf (Accessed June 2020)

out landside land plots as storage yards as an extra revenue stream. Three airports, Cortez Municipal (CEZ), Harriet Alexander Field (ANK), and Yuma Municipal (2V6) reported that they planned to continue operating as normal, however, CEZ noted that it would be utilizing CARES Act funding to operate until recovery is complete.

Several mountain airports reported that they based their recovery projections on the activities of the mountain sports resorts that each airport serves. Each airport had a unique outlook, as some airports including Aspen-Pitkin County (ASE) had conservative projections that extended the recovery period to 2022, while others such as Eagle County Regional (EGE) are projecting that a busier ski season will cause passenger traffic to increase more quickly. Other airports are relying on summertime activities such as flight testing at Gunnison-Crested Butte Regional (GUC) and the Telluride Film Festival planned for early September. Both airports cited these specific events as the factor that will determine how quickly traffic may return and if they are cancelled or delayed, there could be a disruption in activities throughout the rest of the year and into 2021. The projections of the mountain airports are also largely dependent on the snow conditions and capacity restrictions at winter resorts during the 2020-2021 season. However, as it is too early to predict these circumstances, the projections have significant assumptions and could change significantly as the year progresses.

0.5.2. Potential Economic Impacts to Colorado Airports

As the airline industry continues its slow path to recovery from the pandemic, airports, airlines and industry organizations are working to identify the potential total impacts in an effort to minimize the long term effects of the pandemic. In the context of this analysis, specifically in relation to the findings of the 2020 CEIS, it is important to understand the potential quantitative impacts of the pandemic. As such, this analysis has identified three scenarios and provided a high-level analysis of the potential effects that a change in commercial and GA passenger traffic at Colorado's airports could have on the overall economic impacts of Colorado's airport system.

The CEIS categorized economic impacts of the Colorado airport system by three types: on-airport activities, visitor spending, and off-airport cargo, which are discussed further in **CEIS Chapter 5. Airport Economic Impact Findings.** The most significant change in economic impact is estimated to be from the reduction in visitor spending at both commercial service and GA airports. Visitors impact an airport's economic impact, but have the most significant effect on other industries outside of the airport and aviation sector such as lodging, food and beverage, and retail. During the airport outreach conducted for this analysis, no airport managers reported changes among airport sponsor staffing. Many airport managers noted staffing changes to airlines and rental cars, as well as FBOs, restaurants, and MRO shops, but were unable to provide specific quantitative information. Many noted they were unaware of specific long-term layoffs, but did know of reductions in employee hours or reduced seasonal staffing at the end of the winter season. As such, it is difficult to develop a specific scenario that might reflect likely changes to on-airport activities, either from airport administration or tenants. Furthermore, no airport reported any significant delays to large federally funded capital improvement projects, making it unnecessary to develop a scenario that considers changes to airport construction activities. Finally, given that air cargo activities have actually increased as a result of the stay-at-home orders resulting in more e-commerce and the influx of medical supplies, a scenario for decreases in activities in the off-airport cargo sector is unnecessary.

Tables 0.7, 0.8, and 0.9 present the respective potential effects that a 10 percent, 30 percent, and 50 percent decline in 2020 passenger traffic would have on the visitor spending-related impacts individually, as well as the total statewide economic impacts of the Colorado airport system as determined in the 2020 CEIS. These percentages were chosen based on both airport-reported projections and actual activity data from the first two months of the pandemic. This data was multiplied by data from an aggregate recovery timeline derived from the scenarios presented in **Section 0.5.1** to estimate the total activity reductions at airports statewide for the remainder of 2020. These estimates were then analyzed, and percentages were selected to represent scenarios that included low, medium, and high declines in passenger activity. Additionally, these tables present the statewide economic impacts for calendar year 2018 as reported by the 2020 CEIS and provide a comparison between these findings and the potential economic impacts that would be realized given the various potential annual reductions in passenger traffic. As demonstrated, the decline in visitor spending activities result in an uneven impact across the four indicators of statewide economic impact – jobs, payroll, value added, or business revenues. The percent reduction (10, 30, and 50) also doesn't necessarily reflect the same amount of change in total economic impact on a statewide basis. These scenarios reflect the important economic contributions of the state's airport system, even during an unprecedented event such as the pandemic. It is important to note that Denver International (DEN) accounts for 45 to 56 percent of Colorado's visitor spending activities, depending on the various indicators. As such, the actual impacts of the pandemic will be highly dependent on the changes to passenger traffic at DEN.

Table 0.7. Scenario #1: 10 Percent Decrease in Passenger Traffic

	Jobs	Payroll	Value Added	Business Revenues
2020 CEIS Statewide Economic Impacts	345,661	$16,173,035,000	$27,025,194,000	$48,613,199,000
Impacts to Visitor Spending	*-19,786*	*-$685,095,300*	*-$1,168,616,400*	*-$2,023,101,700*
Percent change from 2020 CEIS Findings	**-6%**	**-4%**	**-4%**	**-4%**
Scenario #1 Statewide Economic Impacts	325,875	$15,487,939,700	$25,856,577,600	$46,590,097,300

Source: 2020 CEIS, 2020 CASP COVID-19 Impacts to Colorado Airports Questionnaire Results, June 2020

Table 0.8. Scenario #2: 30 Percent Decrease in Passenger Traffic

	Jobs	Payroll	Value Added	Business Revenues
2020 CEIS Statewide Economic Impacts	345,661	$16,173,035,000	$27,025,194,000	$48,613,199,000
Impacts to Visitor Spending	*-59,358*	*-$2,055,285,900*	*-$3,505,849,200*	*-$6,069,305,100*
Percent change from 2020 CEIS Findings	-17%	-13%	-13%	-12%
Scenario #2 Statewide Economic Impacts	286,303	$14,117,749,100	$23,519,344,800	$42,543,893,900

Source: 2020 CEIS, 2020 CASP COVID-19 Impacts to Colorado Airports Questionnaire Results, June 2020

Table 0. 9 Scenario #3: 50 Percent Decrease in Passenger Traffic

	Jobs	Payroll	Value Added	Business Revenues
2020 CEIS Statewide Economic Impacts	345,661	$16,173,035,000	$27,025,194,000	$48,613,199,000
Impacts to Visitor Spending	*-98,931*	*-$3,425,476,500*	*-$5,843,082,000*	*-$10,115,508,500*
Percent change from 2020 CEIS Findings	-29%	-21%	-22%	-21%
Scenario #1 Statewide Economic Impacts	246,731	$12,747,558,500	$21,182,112,000	$38,497,690,500

Source: 2020 CEIS, 2020 CASP COVID-19 Impacts to Colorado Airports Questionnaire Results, June 2020

0.5.3. Future Trends

As the impacts of the pandemic have been so severe, it is highly unlikely that the aviation industry will return to its normal operating procedures and patterns from before the pandemic. As such, a series of trends have begun to emerge that will likely continue beyond the industry recovery period. These trends include a shift in consumer behaviors, numerous airline restructurings or consolidations, and airline fleet restructuring.

0.5.3.1 Shifts in Consumer Behaviors

The pandemic has forced millions of businessmen and women to shift how they do business from in-person meetings to using virtual meeting technology. The general success of such virtual business practices has illustrated to thousands of companies that travel may not be a necessity of doing business post-pandemic. As a result, there could be a decline in business air travel demand that extends beyond the recovery period. For those businesses that do travel, there could be a shift away from commercial flights towards the use of chartered business aircraft or purchase of GA aircraft. Charter operations have already become more popular during the pandemic as companies and travelers have opted to travel in smaller groups in a more isolated environment than a commercial passenger airline provides. Paramount Business Jets, a global charter aircraft operator, reported that charter requests in April increased 53 percent in North America and 103 percent globally. Additionally, charter operations have

become more cost competitive with traditional airline flights as corporate charter aircraft operators are experiencing lower taxes with the 7.5 percent federal excise tax usually charged on charter flights suspended until 2021 by the CARES Act.[36]

0.5.3.2 Airline/Fleet Restructuring

After other significant events such as 9/11 or the 2008 Global Financial Crisis, the airline industry experienced drastic changes in both airline management and fleet structures. It is highly likely that the airline industry will similarly change as multiple airlines have already had to file for bankruptcy. Airlines could restructure or merge, creating a smaller number of large airlines, reducing overall competition and increasing airfare prices. This could boost the passenger segment briefly but could negatively affect overall passenger demand. As a result, airlines may focus on serving profitable routes, which, although it will boost traffic at select hub airports, will adversely affect regional airports. This shift could further reduce connectivity and lead to a reduction in overall economic activity for airports.

In addition to the reorganization of airline management and route structuring, airlines are likely to alter their aircraft fleets to maximize operating efficiency. Airlines have already started retiring older and larger aircraft and will most likely continue to do so while passenger demand remains below the 2019 baseline. As such, companies are retiring aircraft such as the Boeing 747 and Airbus A380 while shifting towards smaller or more efficient aircraft such as the Airbus A321LR and the Boeing 787. As a result, airports that have been built to accommodate heavy jet aircraft will soon be over-equipped, creating high overhead costs and adversely affecting large airports around the globe. Conversely, airports served only by smaller commercial aircraft have the potential to be served by larger aircraft depending on the airlines' fleet availability and route planning, causing a possible overextension of airport infrastructure capabilities.[37]

The airline industry may undergo other changes to cater to consumer preferences and improve overall safety in aviation. Notably, airlines and airports may continue heightened cleaning procedures onboard aircraft and in airports well beyond the industry's recovery period to maintain public confidence in the safety of air travel. Furthermore, airlines, airports and agencies such as the TSA may continue the use of additional passenger screening to identify travelers that may pose a risk of infecting other users. However, these changes may pose additional challenges and expenses for the industry and may be modified appropriately.

Finally, certain challenges that existed in the industry before the pandemic have changed but remain a threat to the stability of airlines and aviation. Specifically, the chronic pilot shortage that has existed in the industry for nearly a decade has quickly dissipated as airlines suspended hiring and furloughed thousands of pilots, with potentially more in October 2020. However, given that many airlines have offered early retirement to flight crews, this shortage will likely return as the airline industry recovers. This problem could be further exacerbated as prospective pilots delay or cancel their flight training due to poor career prospects, further constricting the pipeline of new pilots into the industry.

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[36] NBAA (May 2020). "Lower Prices, Safety Concerns Drive Charter Resurgence". Available online at: https://nbaa.org/flight-department-administration/aircraft-operating-ownership-options/lower-prices-safety-concerns-drive-charter-resurgence/. (Accessed June 2020).

[37] Gittens, A. (May 2020). "COVID-19: Exploring the airport industry's path to economic recovery". Available online at: https://blog.aci.aero/covid-19-exploring-the-airport-industrys-path-to-economic-recovery/. (Accessed June 2020).

Therefore, airlines and aviation education programs will have to work in coordination to restore the supply of skilled pilots in order for the industry to recover fully and continue to grow in the coming years.

0.6. Summary

It is apparent that the COVID-19 pandemic has caused disruptions to the global economy and aviation industry that have not been experienced before. As such, this analysis sought to provide context for readers of the 2020 CASP and CEIS by discussing the overall situation surrounding the pandemic as well as the impacts of the crisis on the global aviation industry. Additionally, this analysis provides a focused review of the specific impacts of the pandemic on Colorado's commercial service and general aviation airports. Results from this postscript analysis can be compared to the findings of the 2020 CASP and CEIS to determine the current needs and impacts of the aviation industry and will provide an overview of the possible ways the aviation industry could recover from the crisis.