Forecast Uncertainties

The forecasts in this document are forecasts of aviation demand, driven by models built on forecasts of economic activity. There are many assumptions in both the economic forecasts and in the FAA models that could affect the degree to which these forecasts are realized. This year's forecast is driven, at least in the near-term, by the pace of recovery from the impacts to the U.S. and global economies and the aviation industry resulting from the novel coronavirus (COVID-19). It does go without saying that terrorism remains among the greatest world-wide risks to aviation growth. Any terrorist incident aimed at aviation could have an immediate and significant impact on the demand for aviation services that could be greater than its impact on overall economic activity.

In addition, changes in the geo-political landscape could lead to outcomes very different than the forecasts provided in this document. The ongoing crisis in Ukraine represents a very large uncertainty to this year's forecast. The impacts are still evolving and dependent in large part on the outcome of the armed conflict in Ukraine. While there was an initial negative impact on airline bookings as well as a surge in oil prices, those impacts have diminished over time. The impact of the economic sanctions on Russia have pushed the Russian economy (the world's 12th largest as of 2021) into a sharp and prolonged recession that may have broad spillover effects to the global economy. European economic growth slowed in 2022 as Europe moved to restrict trade with Russia and its allies, and reduce its dependence on energy from Russia. Many forecasters see continued low European economic growth in 2023 as well due to the impacts of the conflict. In the longer run, most analysts are seeing a return to higher tensions between Russia and the West resulting in higher expenditures on defense that may push taxes higher, and leave consumers with less money to spend on items like air travel.

The rapid spread of the novel coronavirus (COVID-19) that began in early 2020 resulted in the largest decline in aviation activity since the jet era began in the late 1950's. While aviation activity has almost fully recovered to pre-pandemic levels, there is still a good deal of uncertainty about the long run path of aviation activity once the recovery from the 2020 downturn is complete. There are questions as to whether or not the strategies that U.S. and foreign carriers are employing to recover from the downturn in demand will be successful in a post-COVID environment. Other questions surround the stability of consumer attitudes and behaviors towards aviation in a post-COVID environment, as well as the breadth and depth of the and the speed and nature of the economic recovery, all of which apply both domestically and globally.

The future direction of oil prices presents another considerable uncertainty in producing the forecast. The FAA's baseline forecast (derived from economic assumptions in IHS Global Insight's December 2022 U.S. macro forecast and 30-Year Focus released during December 2022) calls for oil prices to fall from $95 per barrel in 2022 to $75 per barrel

in 2023. Over the long term, the FAA baseline forecast assumes that oil prices will rise gradually to about $91 per barrel in 2030 and about $118 per barrel by the end of the forecast period in 2043. However, there are other oil price forecasts that are considerably more aggressive than the FAA base forecast such as the latest Energy Information Administration (EIA) Annual Energy Outlook released in March 2023. By 2030, it anticipates the spot price of oil will reach $106 per barrel and by 2043, $153 per barrel, considerably above the FAA base forecast of $118. Over the long run, lower oil prices give consumers an impetus for additional spending, including air travel, and should enhance industry profitability. In the case where oil prices turn out to be higher than the FAA forecast, we would expect lower spending on air travel by consumers, higher costs for fuel to airlines and reduced industry profitability.

The baseline forecast incorporates additional infrastructure spending in 2023 and beyond. However, there is considerable uncertainty as to the magnitude, timing, and nature of these programs that ultimately determines the impact on the future growth of the U.S. economy. In addition, how the U.S. will engage with the rest of the global economy over the next several years continues to evolve. Under the right conditions, a period of sustained high and more inclusive growth along with increased financial stability could occur. However, in light of the recent Russia-Ukraine conflict there is an increased possibility of an outcome that leads to greater global economic fragmentation due to rising tensions resulting in slower growth, and increased financial instability.

The baseline forecast assumes that the global economic recovery that began at the end of 2020 will continue but at a slower pace in 2023. Thereafter, the baseline forecast assumes that China and India will be growth engines for emerging economies. The forecast assumes China successfully transitions the economy from heavy reliance on manufacturing and resource industries to one more oriented towards the services and technology sectors and India continues to implement reforms to make its economy more competitive. Many analysts are concerned that in light of the Russia-Ukraine conflict, China moves closer to Russia, limiting opportunities to further transition its economy away from manufacturing and resource intensive industries. In the case of India, the impact of the Russia-Ukraine conflict on energy prices and food prices may put pressure on trade and fiscal deficits resulting in a slowdown of reforms.

In the United States, economic growth in the near term is expected to be slow as the impacts of the Federal Reserve's moves to reduce inflation by raising interest rates are felt by consumers and businesses. The forecast anticipates that inflation returns to acceptable levels by 2024. Over the forecast horizon economic growth (real GDP) remains below 2 percent as population growth and productivity growth remain lower than historic averages. The forecast does not assume any measure of fiscal restraint will be implemented, despite government debt as percent of GDP exceeding 100 percent and approaching levels that were last seen at the end of World War 2. In Japan, the United Kingdom, and the European Union economic growth over the next few years will be well below rates seen over the past few years as these regions recovered from the COVID-19 recession. Demand growth will remain slow in these regions over the forecast horizon as they continue to be constrained by structural economic problems (high debt, slow popula-

tion growth, weak public finances, for example) and political instability. In most of the major advanced economies, governments need to shore up their finances after the increases in government spending to offset the impacts of COVID-19. There exists a non-trivial possibility that authorities will either act prematurely or be excessively timid and late in taking necessary steps to maintain a healthy global economy. The current forecasts call for strong passenger growth for travel between the United States and other world regions, especially over the next few years. An unexpected slowing of worldwide economic activity could push the return of international passenger demand to pre-COVID levels beyond our current forecast of 2024.

Although U.S. airline finances have been decimated as a result of COVID-19 and the fall in demand, the outlook for further consolidation either through mergers and acquisitions (M&A) or bankruptcy appears to be rather limited, with one exception: a planned merger between JetBlue Airways and Spirit Airlines, pending regulatory approval. Ultra low-cost carriers which focus on domestic leisure traffic have been fastest to recover during the pandemic, putting them in relatively strong positions in recent quarters, and creating the opportunity for a merger. Based on FY 2022 data, the top 6 (American, Delta, United, Southwest, Alaska and JetBlue) accounted for about 82 percent of the U.S. airline industry capacity and traffic, and a combined JetBlue and Spirit would make up about 10 percent. For the large network carriers, the steps they have taken to increase their liquidity have reduced the risk of bankruptcy in the next few years. However, if the demand recovery is slower than expected, the increase in debt that these carriers are servicing may be a burden and increase the possibility of a bankruptcy or liquidation. While the announced merger of JetBlue and Spirit shows that in the right circumstances, consolidation among low cost carriers can happen, in general, the risk associated with a merger today compared to pre-COVID has increased due to the poorer financial condition of carriers.

The forecast assumes the addition of sizable numbers of large regional jets (70 to 90 seats) into the fleets of regional carriers. While the recovery in air travel demand from the COVID downturn is projected to be robust, we are not projecting a uniform recovery across all segments. As network carriers continue to adjust the size and breadth of their networks in anticipation of the post-COVID environment, they are continuing to move forward with plans to significantly reduce the numbers of small regional jets they will need. Prior to the COVID downturn in 2020, strong air travel demand has not ensured financial stability for regional carriers, as the bankruptcy filings of Republic Airways in 2016, Great Lakes Airlines in 2018 and Trans States Airlines in 2020 have shown. Financially strong and well positioned regional carriers may see increased opportunities for regional flying as a result of the network carrier actions, but the overall impact will most likely reduce opportunities for many regional carriers. In addition to managing changing relationships with network carriers, regional carriers have struggled with pilot shortages that were exacerbated during the pandemic recovery. The downturn prompted mainline carriers to reduce costs by, among other measures, offering voluntary retirements to flight crews but, as activity picked up, they drew replacements from the ranks of regionals, causing additional shortages for those carriers. To attract and recruit crews,

some carriers have raised salaries and offered bonuses, further increasing financial pressures and possibly leading to new consolidation in the regional airline industry.

The general aviation sector did suffer a downturn in activity in 2020 due to the impacts of COVID-19, but the magnitude of the decline was much less than the decline in commercial aviation. By the end of 2021 most sectors, including corporate and business aviation, were at or exceeding pre-COVID activity levels and GA flight hours exceeded pre-COVID levels. Once returning to pre-COVID levels of activity, future growth in business and corporate aviation is based largely upon the prospects for economic growth and corporate profits. Uncertainty in these leading indicators poses a risk to the forecast, but the risk is not limited to these factors. Other influences, such as potential environmental regulations and taxes do not seem to be as much of a concern in the short term, but over the long term, uncertainties about the direction of these influences may place downward pressure on the forecast.

Overall activity at FAA and contract towers rose 10.2 percent in 2022, while activity at large and medium hub airports (64 in total) increased 24.2 percent and 14.9 percent, respectively, in 2022, leading to a summer of congestion and delays. While FAA's baseline forecast calls for operations at FAA and contract towers to return to pre-COVID levels of activity by 2023, in the long run, operations at large and medium hub airports grow faster than the overall national trend and congestion and delays could become critical limits to growth over the forecast period. FAA's forecasts of both demand and operations are unconstrained in that they assume that there will be sufficient infrastructure to handle the projected levels of activity. Should the infrastructure be inadequate and result in even more congestion and delays, it is likely that the forecasts of both demand and operations would not be achieved.

Not only is the volume of aircraft operating at most large hubs expected to increase over the next 20 years, but the mix of aircraft is changing for this same period. The expected increases in the numbers of larger regional jets and business jets as well as the anticipated widespread deployment of UAS and Advanced Air Mobility (AAM) vehicles into the national airspace system will make the FAA's job more challenging. For example, in adding these new vehicles to the system, they could replace existing traditional aircraft. This change in the mix of aircraft will most likely add to workload above and beyond the increasing demand for aviation services resulting from the growth in operations over the forecast period.

Increasing concerns about aviation's environmental impacts could potentially limit or delay the ability of the aviation sector to grow to meet national economic and mobility needs. Airspace modernization and airport expansion or new construction are often contentious because of concerns over noise, air quality, and water quality. Climate change is also of concern and could limit aviation growth. In Europe, concerns about climate change are leading to restrictions on airport expansion activities and proposals to limit short-haul domestic flights. Community concerns across the U.S. about aviation noise have led to increasing levels of public debate, political interest, and even litigation. Without effective measures to mitigate and abate aviation noise, the infrastructure projects and airspace redesign efforts needed to support currently forecasted aviation growth may be delayed. Similarly, community concerns about environmental and/or other con-

siderations (e.g., privacy concerns) associated with UAS, AAM, and commercial space launch activity could impact growth in these aviation areas.

In addition to providing economic benefits, technologies to improve aircraft fuel efficiency and reduce fuel consumption provide benefits in terms of reduced emissions that impact air quality and climate change; many technologies that improve fuel efficiency also result in reduced noise. Airlines are increasing their use of sustainable aviation fuels, which provides benefits in terms of reduced impacts of aviation on climate change and air quality. The implementation of the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA), a global market-based measure for international carbon dioxide emissions, will help ensure an approach that is economically preferable to a patchwork of State or Regional-level regulations around the world is used, and will help to further address the impacts of aviation on climate change. Industry, the U.S. government, and international aviation, through ICAO, have all set an ambitious goal of moving the sector to net zero carbon dioxide emissions by 2050. Continued advancements and fleetwide uptake of sustainable aviation fuels and new aircraft and engine technologies that result in improved fuel efficiency, reduced fuel consumption, noise reduction and reduced emissions are required to ensure that access restrictions or operating limitations are not imposed on the in-service fleet, which in turn may dampen the growth of civil aviation.

Widespread deployment of UAS and AAM vehicles, and the electrification of conventional general aviation and short haul aircraft are other potential near term tools for reducing aviation emissions, provided they replace traditional aircraft in the movement of people and goods and their power requirements are met using sustainable sources. Otherwise, such vehicles would result in a net life-cycle increase in environmental impacts. The expansion of commercial space launch activity could also change the mix of aircraft in service, with associated impacts on aviation noise and emissions. The emissions from commercial space operations are expected to have a negative impact on both climate change and the ozone layer; however, the magnitude of the impacts is unknown at this time with the various fuel types currently used to launch vehicles.