COVID-19 - Aviation Personnel and Mental Health Support

At the beginning of 2020 it would have been difficult for any of us to imagine the profound and devastating economic, social, and psychological impact of COVID-19. All of us have been faced with some form of isolation, a lockdown and social distancing. The restrictions were more severe in countries at the epicenters of the virus. Those who remained employed worked from home, using various forms of social media to remain in contact with colleagues, family, and friends. The level of success countries had in initially coping with the virus has varied widely. Several months ago, many countries had lessened restrictions on travel and were in opening restaurants, bars, and other businesses. However, from October through December there has been a significant increase in the number of individuals who tested positive and an increase in hospitalizations and deaths in many countries. Recent statistics reveal that there have been over 20 million cases in the U.S. and a record number of deaths in December (78,000). Globally we have seen nearly 84 million cases and over 1,800,000 deaths. A ray of hope is present in the approval of vaccines by Pfizer and Moderna in the U.S.and others internationally.

The following report in April by Ingrid Miley ("Thousands of aviation personnel lose jobs") reveals the devastating impact of COVID-19 on aviation and related personnel. As many as 25 million aviation jobs worldwide could be lost due to the COVID-19 pandemic, according to the International Air Transport Association. The research shows the potential loss of 11.2 million jobs in Asia-Pacific; 5.6 million jobs in Europe; 2.9 million jobs in Latin America; 2.0 million jobs in North America; 2.0 million jobs in Africa; and 0.9 million jobs in the Middle East. The author points out that younger pilots may be affected disproportionately since 40% of those under 30 have no direct employment relationship with the airline they work for. They are also responsible for six-figure loans they used to fund their pilot training. An example is provided of the case of Norwegian Air where it is claimed that the airline left 1,500 pilots and 3,130 cabin crew unemployed overnight in bases across parts of Europe and the UK.

ECA Secretary-General Philip von Schoppenthau said some airlines had built their empires on the backs of "self-employed" crew, precarious contracts, and agency workers - which allowed them to avoid paying social security contributions, and to shift all financial risk and uncertainty onto the individuals. https://www.rte.ie/news/coronavirus/2020/0427/1135165-pilots-cabin-crew/ Similar concerns were expressed in the notice from the European Aviation Mental Well-being Initiative (EAM-WELL) that was developed following collaboration among several organizations (European Association for Aviation Psychology, European Cockpit Association, European Society of Aerospace Medicine, Mayday Foundation, and Centre for Aviation Psychology. http://eppsi.eu/european-aviation-mental-well-being-initiative-eam-well/

In the middle of May there was an estimate that U.S. carriers were losing around 350-400 million dollars each day. Delta has announced that they will need 7,000 fewer pilots in the fall. IATA has reported that airline companies in Europe will lose more than 76 billion dollars in the aftermath of the virus. It is anticipated that some carriers will not survive. While travel restrictions are being removed, it is unclear when international travel will open. A video by CNBC provides an overview of the impact by describing how over 16,000 aircraft are idle. Think of the issues associated with aircraft maintenance and risk-based decisions that will need to be made as the industry recovers. https://www.cnbc.com/2020/05/01/how-airlines-found-parking-for-thousands-of-planes-amid-coronavirus.html

Information from EUROCONTROL indicates that in March air traffic was 85% of the 2019 level. While that reflects a gradual recovery, in June the level remained 45% below the previous year. Ashley Halperin, in a May 21 article in Conde Nast Traveler, provides comments from a controller at the Los Angeles TRACON, who indicated that traffic into Los Angeles that typically varied from 56 to 72 planes was now down to 18 aircraft an hour. Many of those planes only have a few passengers on board. Work hours have been reduced and there is a dynamic nature to current ATC staffing. The number of radar positions has been reduced from six to two and the space between the two has increased significantly. The COVID-19 Air Traffic Dashboard provides extensive details regarding the Operational and Economic impacts. https://www.icao.int/sustainability/Pages/COVID-19-Air-Traffic-Dashboard.aspx. Recent information from ICAO reveals that in the third quarter of 2020 passenger seat capacity was 56% below capacity. Projections for the fourth quarter were 46-48%. This translates into $327 billion in passenger revenue loss from January to October. Recent IATA data concerning Revenue Passenger Kilometers (RPK) reveals that in 2020 global traffic was down 65.9%. The overall decline was 48.8% in domestic travel and 75.6% internationally. ICAO (2021, Feb.) provides extensive information regarding the economic impact of COVID-19 and the near-term outlook. https://www.icao.int/sustainability/Documents/COVID-9/ICAO_Coronavirus_Econ_Impact.pdf The data reveal an "overall reduction of 50% of seats, a reduction of 2,699 million passengers and an approximate USD 371 billion loss of gross passenger operating revenues of airlines." In a January article Jay Singh described the economic impact on US airlines. The revenue losses ranged from $1.3 billion for JetBlue and Alaska Airlines to $12.4 billion for Delta Air Lines. Like Delta, American Airlines ($8.9 billion) and United Airlines ($7.1 billion) suffered higher losses due to the dramatic reduction in international travel.

While the U.S. CARES Act allowed airlines to continue paying personnel during the initial stages of the coronavirus, that funding ended in the fall. CBS news reported that 80,000 pilots, flight attendants and other airline workers face unpaid time off and an uncertain future. Business travel has been severely impacted by COVID-19 and may never fully recover. Delta Air Lines had a reported loss of $2.8 billion in July. About 20% of their workforce left the workforce through buyout packages or by taking early retirement. United Airlines earlier warned that almost half of its front-line workforce (36,000) could be furloughed in fall. The impact would be felt on the 15,000 flight attendants, 11,000 customer service representatives and gate agents, 5,550 maintenance employees and 2,250 pilots. Previous news accounts indicated that at least one carrier was seeking to gain union approval to reduce the pay of some personnel. Route cancellations, the reduction in overseas flights, and personnel reassignments have presented significant challenges for airline management and personnel. These changes along with the

financial loss are significant sources of stress. In the U.S., passage of the COVID-19 Aid Bill in December will, according to a report in the Wall Street Journal, provide $15 billion in funding for airlines. This will allow airlines to bring back many furloughed employees and provide about 4 months of support. Recent news articles have indicated that some airlines have warned airline employees that furloughs will occur when funding expires in April. However, recent restrictions in travel to and from Great Britain reveal how tenuous the recovery can be. Media reports have indicated that airlines are calling for a requirement that international passengers demonstrate a negative COVID-19PCR test. Canada implemented that requirement in January. Efforts are underway to establish a database that contains the necessary information. Unfortunately, there are two competing proposals, one developed by Commons Project Foundation, the other by IATA. Under the Commons Project Foundation information from individuals would be transferred to their app and shared with the airlines. An initial trial involving Cathy Pacific and United provided positive results. They were working with three companies that conduct COVID-19PCR testing. IATA is calling for establishment of a global database. The digital passport would support both Covid-19 vaccination and COVID-19PCR data. The CDC has developed a proposal to require that all international travelers into the U.S. provide evidence of a negative COVID-19 test (72 hours prior to arrival). This is already required for any travelers from the U.S. to Hawaii. This development along with improvements in the rate of vaccinations may lead to increased international and domestic travel by the end of summer.

Changes in the nature and type of operations during and post COVID led BALPA to release a list of 11 most wanted safety issues, the center of which is commercial pressure. Other elements include aircraft certification, pilot training, fatigue, cabin air quality, CPVOD-19 effects, lithium batteries, helicopter operations, UAV (drones), security, and regulatory capture (Pilots launch new 'Most Wanted' Safety Campaign | BALPA). A recent article 'Pilot training during a pandemic" in the Airline Pilot Magazine was focused on issues associated with exemptions to recurrent training and weaknesses identified in the shift to distance learning (distractions, inability to identify individuals who are struggling with the contents, availability of additional support, and validation that the training was successful). In October IATA published "Guidance for managing pilot training and licensing during COVID-19 operations: Edition 2." The document is focused on the safety assessment of training programs, proficiency checks, recency of experience, and area, route, and aerodrome qualifications. Best practices are identified for operation of training facilities during COVID-19. This is only a summary of some of the many impacts and responses to the aviation-related impacts of the pandemic and challenges associated with recovery. Since the start of the pandemic there has been a dramatic increase in the amount of information and guidance available regarding prevention efforts and support for improving safety in the workplace. In the U.S. guidance can be found on the OSHA web site: Coronavirus Disease (COVID-19) | Occupational Safety and Health Administration (osha.gov) as well as the CDC: Coronavirus Disease 2019 (COVID-19) CDC. Internationally, information can be found on the WHO website: WHO/Europe | Coronavirus disease (COVID-19) outbreak, as well as health authorities in each country.

Aviation-Related Information. In the wake of the virus, regulators, air carriers, and industry organizations have provided information for the aviation community. ALPA has been working on efforts for U.S. and Canadian governments to enact protections for aviation workers.

This remains as a critical issue, not only for pilots and flight attendants but for the flying public. Quay Snyder reminded me that ALPA and its carriers have a robust set of Peer Support Groups (some 150+ trained and tested volunteers) are available to provide support for pilots. Robert Bor and Dave Fielding have worked with the UK NHS health care workers to provide peer support for pilots. New Zealand ALPA (NZALPA) has an excellent model and supplies peer support for pilots and air traffic controllers. The pilot assistance network (PAN) for Qantas and AIPA provides support for pilots and their families. EASA has mandated implementation of peer support programs and HIMS type program in the EU by August 2002, but this has recently been pushed back to February 2021. Cahill et al. (2019) reported on use of the Patient Health Questionnaire (PHQ-9) to evaluate depressive symptoms as part of a survey of 1,058 pilots (729 pilots completed the PHQ-9). They found that 17.78% met the threshold for Clinical Depression. However, pilots reported that they were adapting and coping. Information was gained regarding factors that contributed to work related stress (WRS). Cahill et al. recently posted a summary of results from a July/August 2020 survey of 2,050 aviation personnel. As indicated above, COVID-19 has had a huge impact on aviation personnel. Compared with results from the earlier pre COVID survey, there was a higher percentage meeting the criteria for anxiety and depression. Half of all respondents reported that they had lost their jobs, yet many hope to return to work after the pandemic. While many report practicing self-care, there will be a continuing need for strong peer and organizational support to generate a more positive wellbeing culture. Further information from this investigation is provided in a recent report by Cahill et al. (2021). They found that the three most common contributors to WRS involved sleep difficulties (81%), musculoskeletal symptoms (73.5%), and digestive symptoms (58.5%). The authors found that pilots who focused their coping strategies on fatigue/sleep management, exercise, and management of their diets reported lower levels of depression. Information concerning an enhanced I'm safe checklist for pilots is also provided.

EASA has an ongoing "Together4Safety" program as well as a COVID-19 web site that provides supportive information. Details for COVID-19 support materials and Well-being can be found at the following website (Wellbeing | EASA Community (europa.eu). This represents the first phase of a two-phase resource hub and involves a career training package and useful information on Wellbeing for members of the aviation community. The Wellbeing course (Career Support and Wellbeing – EASA Safety Promotion) is focused around looking after yourself, managing others, and managing the impact on your career. The second phase is scheduled for release in January 2021 and will include a more extensive set of Wellbeing resources for individuals and organizations. Consideration is being given to a third phase for those who are not currently employed.

In the U.S., the Center for Disease Control (CDC) provides COVID-19 guidance for both the aircrew and for aviation maintenance personnel. The documents also include recommendations for management. The IFALPA website lists several documents regarding COVID-19: COVID-19 Guidance for Crews, Fatigue Mitigation for Flights Affected by COVID-19 restrictions, COVID-19 Medical and License Validity – ICAO State Letter, and IFALPA formed a COVID-19 Industrial Response Team. ICAO also has COVID-19 information available on their website. This includes a large segment focused on Aviation and COVID-19 that supplies extensive information for transport operators and the public. Another section includes information concerning a COVID-19 webinar series. In November ICAO published an

Electronic Bulletin "Promoting, Maintaining and Supporting Mental Well-Being in Aviation During the COVID-19 Pandemic." https://box.icao.int/link/ot3SqpPvyLv5xd9gidyxAO Recommendations are provided for all stake holders. An attachment describes the importance of Peer Support in contributing to a positive safety culture. IATA has also provided information and guidance. https://www.iata.org/en/programs/covid-19-resources-guidelines/ The EPPSI document "COVID-19 crisis and its effect on aviation mental health" highlights many of the stressors faced by flight crew in their operational environment. The document and additional information can be found at the following websites (http://eppsi.eu/european-aviation-mental-well-being-initiative-eam-well/ and http://eppsi.eu/news/eppsi-guide-on-peer-support/). In May, the Flight Safety Foundation published a document entitled "Pandemic – Non-medical operational safety aspects supplemental materials." Information is provided for personnel in flight operations, air traffic services, airports, ground operations, and maintenance, as well as regulators and manufacturers. Guidelines are provided for continued operations, reduction/cessation of operations, and re-establishing operations. A section on human factors is included under each area. As part of the document, Safety Punch Lists" are provided for each aspect of aviation operations. In April, the Flight Safety Foundation published a document called "An Aviation Professional's Guide to Wellbeing" that provides guidance on how individuals can support the biological, psychological, and social components of wellbeing. There is a strong focus on coping and self-management along with six wellbeing behaviors and a focus on building resilience. Several of these documents, as well as one from ECA illustrate the importance of pilot peer support programs. As European countries opened for travel, in July the CAA issued a safety notice (Number: SN-2020/001) regarding "Human Factors Considerations for Organisations During Covid-19 Restart Activities." Attention was focused around: distraction, decision making, communication, environment, employee confidence, third party, and fatigue. Issues surrounding competence, recency, and familiarity (employee confidence) are of importance, depending on how long personnel have been absent from their flying and other aviation-related duties. The U.S. Association of Flight Attendants-CWA, AFL-CIO also has a website that has been continually updated to provide COVID-19 information along with resources for coping and finances (https://www.afacwa.org/coronavirus). The December issue of the FAA Aviation Mx Human Factors Quarterly contains several articles concerning COVID-19, its impact on aviation personnel and approaches and resources available to help maintainers cope more effectively. A copy of the newsletter (December 2020, Vol 8, Issue 4) can be downloaded from:
https://www.faa.gov/about/initiatives/maintenance_hf/fatigue/publications/#:~:text=The%20Aviation%20MX%20Human%20Factors%20Quarterly%20is%20written,that%20affect%20human%20performance%20in%20maintenance%20and%20inspection.

Psychological Impact of COVID-19. Much of the available literature identified ways in which you can protect yourself from exposure to the coronavirus, with specific information focused on pilots and flight attendants. Less information is available about how to deal with the social and psychological impact on individuals and their families. In March, the American Psychiatric Association released information concerning results from a poll of the American public on the impact of COVID-19 on their mental well-being. Of the respondents, 48% were concerned about getting the coronavirus, that a family may get it (62%), that it will have a negative impact on their finances (57%) and nearly half felt that they may run out of food, medicine, and/or supplies. At the time, 59% felt it was having a serious impact on their day-to-day lives, with less evidence of an influence on their behavior (sleeping and consumption of

alcohol/drugs). Since the time of the pole the psychosocial impact has increased. The American Psychological Association released a May 20 report on "Stress in the Time of COVID-19," based on a survey of 3,013 Americans. Stress levels are higher than in 2019 and adults who have children reported a higher level of stress than adults without children. Around 70% of Americans view the economy and work as significant sources of stress in their lives. In October, APA reported on results from their "Stress in America™" survey. Over the course of the COVID-19 pandemic 67% reported that their stress had increased. A total of 78% indicated that the pandemic was a significant source of stress in their lives. When asked about their stress in the last month, young adults (18-23 – Gen Z) reported the highest level of stress and older adults (75+) the lowest. Other factors that were significant stressors included "concern about the future of our country," "health care," and "mass shootings." Keeter (2020) in a report on results from the Pew Research Center survey in the U.S., indicated that "one-third of Americans had experienced high levels of distress at some point during the extended period of social distancing." The percentage was higher in those who indicated that their financial situation was poor (55%). A Pew Research Center report "COVID-19 and the country's trajectory revealed the political divide within the U.S. concerning perceptions of the pandemic. In April, 87% of Democrats said that the worst was yet to come, compared with only 56% of Republicans. Similar differences are evident in other perceptions of COVID-19.
https://www.pewresearch.org/politics/2020/04/16/covid-19-and-the-countrys-trajectory/
From an international perspective, Gonzalez-Sanguinao et al. (2020) reported on a cross-sectional survey of 3,480 individuals in Spain. The percentage who reported depressive, anxiety, and PTSD symptoms were 18.7%, 21.6%. and15.8% respectively. Symptoms were lower in older adults who had economic stability and believed that sufficient information had been provided. Xin et al. (2020) explored the relationship between mandatory quarantine status, depressive symptoms, suicidal ideation, emotional distress, perceived risk, and perceived discrimination in a group of Chinese students. Results revealed that the prevalence of moderate to severe depression and emotional distress in quarantined versus nonquarantined individuals. Perceived risk was relatively low in both groups. As part of a longitudinal study Sibley et al. (2020) compared mental distress in New Zealand citizens before and during the nationwide pandemic lockdown. There was evidence of an increase in moderate mental stress from pre to early in the pandemic lockdown (16.2% to 21.1%). Trust in science, the government, politicians, and the police were higher during the pandemic lockdown. A recent study by Taquet et al. (2020) explored the health records of 69 million patients, of whom 62,354 patients were diagnosed with COVID-19. When compared with other health problems, those who were diagnosed with COVID-19 were more likely to receive a psychiatric diagnosis for anxiety, insomnia, and dementia (older patients). Those with a psychiatric diagnosis in the previous year were at greater risk for contracting COVID.

Wang et al. (2020a) reported on the psychological impact and psychiatric symptoms for Chinese citizens during the early months (Jan-Feb) of the pandemic. Of the 1,210 citizens across 194 cities in China "53.8% of respondents rated the psychological impact of the outbreak as moderate or severe; 16.5% reported moderate to severe depressive symptoms; 28.8% reported moderate to severe anxiety symptoms; and 8.1% reported moderate to severe stress levels. Most respondents spent 20–24 h per day at home (84.7%) and were worried about their family members contracting COVID-19 (75.2%). In another nationwide survey in China, Hong Kong, Macau, and Taiwan (52,730 responses) Qiu et al. (2020) reported that almost 35% experienced

psychological distress, with 5% experiencing severe distress using the COVID-19 Peritraumatic Distress Index (CPDI). In a review of the limited scientific literature, Rajkumar (2020) indicated that anxiety and depression (16-28%) and self-reported stress (8%) were common psychological reactions to the coronavirus and there was a need for easy access to mental health services. Torales et al. (2020) provide a quick overview of the impact of COVID-19 on global mental health. They used information from the MERS and SARS outbreaks to illustrate the impact on, not only patients and medical professionals but on the public. Efforts should include a global emphasis on "community supportive psychological interventions." Vindegaard & Benros (2020) reviewed 43 studies that described the psychiatric symptoms or morbidities associated with COVID-19. The two studies that involved COVID-19 patients revealed a high level of posttraumatic stress symptoms and depression. A worsening of symptoms was found in those with a preexisting psychiatric condition. In the public, the pandemic led to lower psychological well-being, and higher scores of anxiety and depression. The authors recommend that greater attention be placed on the importance of mental health care and preventive measures. Another source of more current information regarding anxiety and depression in the U.S. can be found on the CDC website Mental Health - Household Pulse Survey - COVID-19 (cdc.gov). The 20-minute online Household Pulse Survey was developed to provide a means of monitoring the impact of the pandemic. There were three phases of data collection from April 23 to December 21. A four-item questionnaire was used to assess general health and generalized anxiety disorder experienced over the last seven days. Results are presented in a graphic display of the overall percentage with symptoms of an anxiety disorder well as comparisons based on age, gender, racial/Hispanic ethnicity, and by state. The Phase 1 peak was 36.1% in July, Phase 2 was slightly lower (31-32%), in Phase 3 (Nov. 25-Dec. 7) percentages ranged from 36.1 to 37.2%. Comparisons from Phase 3 revealed: (a) that women had higher percentages (40.5 vs. 31.4%), (b) racial/Hispanic ethnicity percentages ranged from 29.7% (non-Hispanic Asian) to 47.1% (non-Hispanic, other races and multiple races, (c) by education the percentages ranged from 31.4% (Bachelor's degree or higher) to 46.9% (Less than high school diploma) (d) percentages declined steadily from 49% of those 18-29 years of age to 16.1 for those 80 year of age and older. The percentage also varied across states. As part of a survey of 575 adults, Gallagher et al. (2020) explored the relationship between experiences with COVID-19 (belief of a diagnosis, confirmed diagnosis, know someone with a diagnosis, know someone deceased with COVID-19) and mental health outcomes. The authors found that "those who endorsed relevant coronavirus experiences demonstrated higher levels of stress, poorer mental health outcomes, and greater levels of functional impairment in particular, with the worst outcomes associated with a confirmed COVID-19 diagnosis and death of a loved one (pg. 1048)." Taylor et al. (2020a,b), using a sample from Canada and the U.S. developed the COVID Stress Scales (CSS). The five factors 36-item measure will provide further insight into the impact of the pandemic on individuals and the mental health consequences. Results do indicate that fear of the danger of COVID-19 is central to this more complex view of COVID-related stress.

Another concern often associated with anxiety and depression involves the role of substance abuse. NIAA information indicates that 85.5% of Americans over the age of 18 have consumed alcohol at some point in their life and 69.5% that they had drank in the past year. We also know that stay-at-home orders in many states involved closure of bars and restricted dine-in service at restaurants. Several media outlets have reported that retail alcohol sales have surged during the pandemic. A recent web-based survey conducted at the North Carolina Research

Triangle International (Barbosa, Cowell, Dowd, 2020) explored alcohol consumption in February and April. Questions were also focused on mental health, employment status, and lifetime alcohol experience. The authors reported that respondents demonstrated significant changes in the average number of drinks per day (.74 to .94), the percentage exceeding drinking guidelines increased (29% to 36%), and that binge drinking had also increased (22% to 27%). There was also evidence that changes in the drinking patterns were influenced by certain demographic factors. One of the key takeaways was that "being female, Black, or having children in the household was associated with significant increases on at least one measure (slide 56)." These results contradict some earlier predictions. Pollard, Tucker, & Green (2020), using results from pre (April-June 2019) and post (May-June 2020) pandemic surveys of the RAND Corporation American Life Panel (ALP) regarding alcohol use and heavy drinking. A significant increase was found in the frequency of alcohol consumption (14%). Information gained from a Short Inventory of Problems associated with alcohol use in the past 3 months revealed that there was a 39% increase for women. Wang et al (2020b) used electronic health records from over 73 million unique patients to study the relationship between COVID-19 and substance use disorder (SUD). There were 12,030 in that group who had a diagnosis of COVID-19. They found that patients with a SUD disorder diagnosis in the past year had a significantly higher increased risk for COVID-19. This was stronger in those with an opioid or tobacco use disorder. African Americans with SUD were also at greater risk. Part of this effect may be attributed to the fact that SUD patients also had a higher "prevalence of chronic kidney, liver, lung diseases, cardiovascular diseases, type 2 diabetes, obesity, and cancer."

Brooks et al. (2020) reviewed 24 publications focused on the psychological impact of a quarantine. Common stressors included: infection fears, frustration, boredom, inadequate supplies, inadequate information, monetary loss, and stigma. Longer durations resulted in greater stress. Despite differences in the duration of the quarantine and other factors the psychological responses provided evidence of anger, stress, irritability, depression, insomnia, and post-traumatic stress disorder. There was also evidence of avoidance behavior following a quarantine, especially among healthcare personnel. The authors provide recommendations about efforts to mitigate the potential impact. Another study of the way in which COVID-19 has impacted many aspects of our lives assessed the impact of changes in physical activity and sedentary behavior (Meyer, et al. 2020). In April 3,052 U.S. adults responded to questions concerning their physical activity (PA), sedentary behavior, and mental health. Those who were physically active prior to COVID reported a 32% reduction in PA. There was evidence of a substantial increase in both sitting and screen time. Results also indicate that the respondents who were previous active and now were no longer active reported "worse mental health across almost all evaluated dimensions compared to those who maintained their activity level (pg. 9)."

Information gained from the effects of earlier viruses and responses to polling clearly illustrate that the coronavirus places added stress on individuals. While the primary focus in this document is on the flight crew, many of the concerns and issues also apply to flight attendants, maintainers, other aviation personnel, and their families. A majority of the stressors are common to both the general public and pilots (fear of personally contracting the virus, fear for the health of a family member, financial concerns due to a furlough or loss of a job, inability to pay rent or the home loan, potential eviction due to unpaid rent/loan, insufficient money for food for the family, potential ongoing medical problems, need to maintain social isolation, inability to

maintain supportive relationship with family members and others in the community, and an exacerbation of anxiety/depression or other psychological conditions). For pilots who are unemployed there is an added concern that there will be fewer jobs available since nearly all carriers have or are reducing the number of flights during the next year. This means that the recovery will be slow, and questions remain concerning the ability of pilots to maintain their currency. In addition, many younger pilots may have a substantial debt due to the cost of their training. What kind of employment will they be able to obtain to pay off those and other debts? Even in dual career families there may be significant financial problems. An added stressor during social isolation was the need to support an active family life in a more confined environment and ensuring that children are completing their schoolwork. The added impact that required parents to address the education and daily basic needs of their children was evident in higher levels of stress and anxiety in the recent APA survey. Given the present state of the coronavirus in the U.S., the issue of whether you children should return to school if the school is open is already a source of stress in children, their parents, and teachers. Several other stressors associated with the flight cancellations and reduction in revenues. Many of the pilots and flight attendants who were involved in international travel are now flying domestic routes. Flight hours may have been reduced. For maintainers, changes in flight operations mean that some may need to shift their work to another location away from their home. There have been carriers who are calling for unions to approve a reduction in pay. These and other factors are significant sources of stress within the organization.

The EPSSI and other documents have identified the stressors faced by pilots who are still working. As flights resume, questions remain concerning the best approach to ensure that both pilots and flight attendants can perform their duties and ensure that they have adequate protection from contracting the coronavirus. While pilots will have less exposure to passengers, flight attendants will have close contact throughout the flight. Airlines have proposed different approaches to reducing the risk (not filling certain seats and requiring everyone to wear a mask). At present, in the U.S. it appears that the requirement to wear a mask has been dictated by individual air carriers. Incidents have occurred where flights returned to the airport because passengers were unwilling to wear a mask.

Factors that influence Compliance. A review of the time course of the coronavirus pandemic in various countries illustrates the importance of the role of individual and collective public behavior in reducing the transmission of the virus. Lunn et al. (2020) conducted a review of the behavioral science literature to find approaches that can aid in reducing transmission. Evidence was found for behavioral support to increase hand washing but not in reducing face touching. Shared social support and development of behavioral plans can help reduce the impact of social isolation. To promote public-spirited behavior, attention should be focused on messages that promote a strong group identity, development of a singular and clear message of what is "best for all," and use of social disapproval for noncompliance. The authors also discuss the importance of communications and the definition of the risks. A recent study by Xie (2020) provides interesting insights into factors that may influence an individual's compliance with COVID-19 recommendations. Using an experimental platform, the authors gained social distance compliance information from 850 U.S. participants in March. The two studies were designed to determine the role of individual differences (working memory capacity (WM) and personality). In their abstract they conclude that "the unique contribution of WM capacity to

individual differences in social distancing at this initial stage could not be explained by other psychological and socioeconomic factors." Further research is needed to fully understand the role of cognitive processes involved in decision-making regarding compliance with scientific recommendations designed to reduce transmission. Van Bavel et al. (2020) used a review of the social and behavioral sciences by a group of experts to identify scientific evidence that supports efforts to increase behavioral compliance with recommendations of epidemiologists and public health experts. Recommendations are provided regarding aspects of threat perception, leadership, individual and collective interests, science communications, social context, and stress and coping. Weaknesses of the response in the U.S. are evident in a failure to develop a shared sense of identity or purpose, failure to cooperate regarding the "right thing to do," lack of bipartisan support, and not preparing individuals for misinformation. They describe how a cultural barrier associated with political polarization can impact compliance. Studies by Gollwitzer et al. (2020) and Gadarian et al. (2002) illustrate the impact of political polarization on the response to the pandemic in the U.S. Gadarian et al. (2020) conducted a survey of individuals' responses to public health recommendations in March. The eight questions included handwashing, hand sanitizer, altered travel plans, visiting the doctor, avoiding physical contact with others, avoiding large gatherings, seeking information from the media, and self-quarantining. Analysis based on individual indications of party affiliation was the single most consistent factor in determining how individuals responded to health behavior recommendations and policy preferences. Republicans were less likely to demonstrate CDC-recommended behaviors and expressed less concern about the pandemic. To determine the possible convergence of attitudes and behaviors a second survey of the same individuals occurred in May. Despite the spread of the pandemic from March to May there was no evidence of partisan convergence. With respect to specific questions the authors found some evidence of divergence in attitudes. For example, Republicans became significantly less likely to support additional expenditure of money on COVID-19 and that the amount of testing was sufficient. Gollwitzer et al. (2020) used daily geotracking of 15 million smart phones to assess physical distancing behaviors in 3,025 counties between March and May. Partisanship of counties was determined by the county-level voting gap in the 2016 election. Results revealed that "the more a county favored Donald Trump over Hillary Clinton in the 2016 election, the less that county exhibited physical distancing between 9 March and 29 May 2020 (pg. 1187)." Physical distancing increased from March to April and then declined as areas of the country started to reopen. While the authors thought that there would be a convergence of the differences as the pandemic worsened, there was an actual increase in the partisan gap. Differences in physical distancing was also influenced by the degree to which people watched either Fox News over CNN or MSNBC. Fox News viewers practiced less physical distancing. From March to May there was also indirect evidence that linked the pro-Trump voting to "marginally higher infection growth rates (pg. 1192)." These results support recommendations provided by Van Bavel et al. (2020) regarding the importance of partisanship, communications, leadership, and modeling in gaining compliance with COVID-19 health and safety recommendations.

There are two ways in which aviation and space research are linked with issues raised by Lunn et al. (2020). The first involves technology that has been developed to provide haptic feedback to pilots and astronauts. In a USA Today (June 30) article, Dalvin Brown described the PULSE pendant developed by engineers at the NASA Jet Propulsion Laboratory that provides a pulse or vibration when a person's hand is nearing their face (https://medeng.jpl.nasa.gov/covid-

19/pulse/). On the website PULSE is described as "a 3D-printed wearable device that pulses, or vibrates, when a person's hand is nearing their face." While behavioral science may not currently have an answer, technology can alert individuals to avoid touching their eyes, nose, or mouth when they have not washed their hands. This is an Open-Source item; with a 3D printer, infrared proximity sensor, coin vibration motor, tactile slide switch, and 3v battery and holder and other materials individuals can make their own pendant. A downloadable PDF is provided. A potential downside is the device will alert you when you want to comb your hair or are eating or drinking.

The second intersection relates to Robert Helmreich and colleagues research that showed that pilots from cultures with a stronger social identity responded differently in responding to cockpit automation then those in the U.S. and other western societies. There is evidence of cultures where there was a stronger social identity, a clear message of the seriousness of the pandemic and what is "best for all" were able to reduce exposure and the impact of the pandemic was reduced (e.g., Singapore, Australia, New Zealand, and Taiwan). In contrast, the U.S. citizens received conflicting messages from the highest levels of their government through state and local governmental leadership. For some individuals, personal freedom and rights are cited as a reason they will not wear a face mask, despite recommendations from WHO and CDC that wearing a mask and maintaining social distance are critical in efforts to reduce exposure. Elements on social media also supported a more anti-science or individualistic response. Even with the rapid increase in the incidence of the coronavirus in the U.S. during the last weeks of June and early July, it was not unusual to see news accounts where people were holding signs and yelling against the need to wear a mask or being disruptive when required to wear a face mask before entering a store. Recent efforts to allow businesses to open and reduce social isolation in most states over the last two months has led to a spike in the number of coronavirus cases and hospitalizations in the U.S. We are now seeing areas where bars and beaches were closed in advance of the July 4 holiday. For some, personal freedom and rights are cited as a reason they will not wear a face mask. Mixed communications from government officials are also a factor in the failure to gain adequate public-spirited behavior (best for all) to reduce the spread of the pandemic.

Coping Resources. What alternatives are there for aviation personnel and their families who are experiencing increased anxiety and depression in response to the lockdown/isolation and presence of the coronavirus? In this electronic age, help is readily available, use your computer, tablet, or smartphone to google "coping with stress and anxiety from Covid-19." At the time I did so, there were 53,500,000 results. A search for "Stress Management" yielded 1,780,000 results. Results were even higher for searches of "Stress Management Techniques" (76,2000,000). Availability for other psychological problems is more restrictive, for example a google search for depression management techniques yielded only 212,000 results. The problem lies in determining which of the recommendations are science-based and have proven clinical effectiveness. The following discussion will (1) identify a few of the approaches to coping with the stress and anxiety of COVID-19; (2) identify concerns associated with seeking psychological help; (3) point out the numerous books and computer-based programs that aid in developing more effective coping techniques, and (4) identify issues and concerns associated with the availability of apps for tablets and smartphones.

(1) There are many websites that promote coping strategies. In the U.S., the Center for Disease Control (CDC) promotes the following, along with more information.

- **Take breaks from watching, reading, or listening to news stories**, including social media. Hearing about the pandemic repeatedly can be upsetting.
- **Take care of your body**.
    - Take deep breaths, stretch, or meditate.
    - Try to eat healthy, well-balanced meals.
    - Exercise regularly, get plenty of sleep.
    - Avoid alcohol and drugs.
- **Make time to unwind**. Try to do some other activities you enjoy.
- **Connect with others**. Talk with people you trust about your concerns and how you are feeling.
- https://www.cdc.gov/coronavirus/2019-ncov/daily-life-coping/managing-stress-anxiety.html

The following websites illustrate various strategies for coping with stress, along with the availability of more resources:
ADAA https://www.Top Ten COVID-19 Anxiety Reduction Strategies | Anxiety and Depression Association of America, ADAA
Allure Newsletter (K. Mooney, March 23, 2020) https://www.allure.com/story/therapist-tips-anxiety-coronavirus
APA (American Psychiatric Association). https://psychiatry.ucsf.edu/coronavirus/coping
https://blogs.webmd.com/mental-health/20200409/what-to-do-if-youre-struggling
APA (American Psychological Association).
https://www.psychology.org.au/getmedia/3821ed7a-1a8a-4e1d-b303-2943ea9ae6b7/20APS-IS-COVID-19-Public-P2_2.pdf
APS (Australian Psychological Society). https://www.psychology.org.au/getmedia/3821ed7a-1a8a-4e1d-b303-2943ea9ae6b7/20APS-IS-COVID-19-Public-P2_2.pdf
CDC. https://emergency.cdc.gov/coping/selfcare.asp
MAYO Clinic. https://www.mayoclinic.org/diseases-conditions/coronavirus/in-depth/mental-health-covid-19/art-20482731?p=1
MAYO Clinic. https://www.mayoclinic.org/healthy-lifestyle/stress-management/in-depth/stress-relievers/art-20047257
NAMI (National Alliance on Mental Illness). https://nami.org/Support-Education/NAMI-HelpLine/COVID-19-Information-and-Resources
NIH (National Institutes of Health). https://www.nih.gov/health-information/your-healthiest-self-wellness-toolkits
Seth Gillihan, Ph.D. https://blogs.webmd.com/mental-health/20200320/5-ways-to-guard-your-mental-health-during-the-covid19_outbreak
WHO (World Health Organization). https://www.who.int/publications-detail/WHO-2019-nCoV-MentalHealth-2020.1

While the lockdowns and restrictions are being released or changed, the pandemic is still present and will required continued efforts to follow guidance provided by the CDC and other health authorities. Many of the coping strategies are still beneficial for dealing with the stress and

anxiety associated with adapting to the changes associated with the presence of the pandemic. Earlier research suggests that, for some individuals, the stress will continue, especially for those who are being continually exposed to the coronavirus through their work. This is especially true for those in the helping professions. In fact, it is predicted that a number of those individuals will experience some degree of PTSD.

(2) Mental Health Support Groups. A google search for mental health support groups recently revealed about 3,740,000 results. In the U.S., information on support groups can be gained through a state or local Mental Health Association or the National Alliance on Mental Illness (NAMI). In a national survey of mental health mutual support groups, Goldstrom et al. (2006) found 3,315 mutual support groups and 3,019 self-help organizations. The authors describe the typical services provided by those groups. On their website the Mayo Clinic has a brief article concerning "Support Groups make connections, get help" that describes the benefits and potential risks associated with support groups. The Depression and BiPolar Support (DPS) and Anxiety and Depression Association of America (ADAA) describe how one can access online support groups for depression and anxiety. Gillard et al. (2017) describe a "principles-based approach" to developing and evaluating the roles of peers involved in supplying mental health support. Gidugu et al. (2015) interviewed individuals who had extensive experience with peer support and identified that peer support provides various "practical, emotional, and social supports." In another review, Repper & Carter (2011) indicated that peer support can help, however it requires careful training, supervision, and management. They concluded that peer support complements traditional mental health services. Studies by Burke, Pyle, Machin, et al. (2019), Davidson et al. (2006), and Mahlke et al. (2014) provide evidence of some of the benefits associated with peer support. However, they also indicated that peer support merits further evaluation and should include complex intervention studies.

At present, the larger carriers within the U.S. and several internationally have established peer support groups for pilots. Presentations at the recent International Pilot Peer Assist (IPPAC) conference in 2019 not only identified the prominent features of, but also showed the benefits and effectiveness of the pilot peer support programs. Snyder (2019) described the best practices for developing an effective peer support program. Curreri (2019) provided a brief review of the literature surrounding peer support and the importance of the presence of a just culture within the organization. Bor & Bekker (2019) described how the Center for Aviation Psychology's (CAP) pilot support program is structured and customized for each air carrier. Details were provided concerning the operation of the program and how data are protected. Lyne Wilson describes the structure and benefits from the NAV Canada peer support for air traffic personnel https://cmha.bc.ca/wp-content/uploads/2016/07/Webinar-PeerSupport-NAVCanada-CMHA_9Oct16.pdf. The Mental Health Commission of Canada has published a document that provides guidance for the practice and training of peer support (Peer Support | Mental Health Commission of Canada). The Association of Flight Attendants-CWA, AFL-CIO provides peer support through their Employee Assistance Program. Eurocontrol provides peer support for air traffic controllers. The impact of COVID-19 is likely to increase the demand for services from the peer support programs.

(3) Professional help. There are several issues associated with obtaining face-to-face

mental health support: (a) requirements to isolate and keep social distance, (b) availability of those services during and following the Coronavirus, and (c) cost of those services. Firth & Flatt (2015) cite evidence from the UK that the National Health Service (NHS) has difficulty in meeting the mental health services, with 1 in 10 needing to wait over a year before receiving treatment. A 2018 National Survey on Drug Use and Health in the U.S. ranked the reasons for not receiving mental health services in the past year. The top five in 2018 included: (1) could not afford the cost, (2) thought they could handle the problem without treatment, (3) did not know where to go for services, (4) did not have time, and (5) health insurance does not pay enough for mental health services. In the survey, 9% indicated that the reason they did not seek services was because it might have a negative effect on their job. Pilots may be hesitant to seek mental health support due to the stigma associated with seeking psychological assistance as well as the potential risk for their medical certification.

Face-to-face interactions during the Coronavirus pandemic are problematic, both for general healthcare personnel as well as those who provide counseling and psychological support. However, as Leite et al. (2020) point out, many countries have invested in telemedicine to manage COVID-19 and earlier restrictions surrounding telemedicine have been waived. Ohannessian et al. (2020) describe a framework for telemedicine during the COVID-19 pandemic. Wright & Caudill (2020) describe several key administrative issues that need to be addressed regarding telemedicine: licensure requirements, malpractice insurance for telemedicine, status of insurance coverage for virtually delivered services, adherence to confidentiality and security regulations, and establishment of protocols for managing laboratory tests, prescriptions, and scheduling. They say that psychiatric treatment is especially suited to telemedicine. Consideration needs to be given to platforms that provide "appropriate confidentiality and security." Treatment approaches often include computer-assisted psychotherapy and mobile apps. Zhou et al. (2020) describe how telehealth can reduce the mental health burden associated with COVID-19. Psychological support can be provided through videoconferencing, e-mail, telephone, online forums, text messaging, or smartphone apps. Examples are provided of how psychological services were provided through various online platforms in China. A table provides a brief list of community online mental health services available in Australia (Betterhelp https://www.betterhelp.com/, Black Dog Institute, https://www.blackdoginstitute.org.au/, Moodgym, https://moodgym.com.au/; E-couch https://ecouch.anu.edu.au/welcome; Beyond Blue, https://www.beyondblue.org.au/; Headspace, https://headspace.org.au/, and RUOK, https://www.ruok.org.au/). Australia has supported the expansion of a greater range of telehealth services.

A recent article by Greenbaum (2020) describes the benefits and issues associated with telehealth and how telepsychology became the sole option for individuals who were under stay-at-home orders. Psychiatric research as well as psychological research has demonstrated the effectiveness of telepsychology (Godleski et al., 2012; Hilty et al., 2013; Mohr et al., 2012; Turgoose et al., 2018; Varker et al., 2019; and Slone et al., 2012) in the provision of mental health services to different groups of individuals across a variety of disorders. Alltucker & Weintraub (2020), in a recent article in the July 7 USA Today, describe how telehealth use surged from December to May (8% to 29%) according to a United Health Group report. There are concerns, evidence from a study at a cardiology clinic in Pennsylvania revealed that older females who did not speak English and lived in a lower income community were less likely to show up for scheduled telehealth visits. Ensuring that patients' medical information is secure on the technology

platforms is also a concern. Dent et al. (2018) describe results from a nationwide innovative telehealth program that used supervised therapists to provide cognitive-behavioral therapy to 1,482 individuals. Details concerning the approach and positive results for those who graduated from the program are provided. In Oklahoma most of the nonprofit organizations have turned to e-healthcare approaches to support the psychological needs of their clients. As a member of the Mental Health Association of Oklahoma I heard how anxiety and depression groups that were meeting via electronic means were becoming increasingly popular. Further research is needed to determine how the approach can be used most effectively in the future and developing regulatory guidelines to support those efforts. The American Telemedicine Website describes the variety and scope of both mental health and health services that are being provided. For all practitioners there is "A concise guide for telemedicine practitioners: Human factors quick guide eye contact" and another for "Medical practice via telemedicine." Additional information available on the website provides guidance for those involved in telehealthcare.

(4) Self-help books. There are numerous books available that provide guidance regarding how to cope more effectively with stress, anxiety, and depression and develop a healthier lifestyle. However, you need to find those that have a solid scientific basis and have proven their effectiveness. Consultation with a mental health professional will provide guidance with respect to those that have a proven ability to motivate individuals to alter their lifestyle. The effectiveness of the approaches requires individuals to remain committed to practicing the techniques and maintaining a focus on expanding their ability. Their effectiveness often involves support from a mental health professional.

(5) Smartphones are common in the U.S. as well as many other countries. In the U.S., users check their phones as often as 150 times each day and many will not leave their home without their cellphone. Leigh (2016) refers to information from studies in the UK that 76% own a smart phone and 76% use a tablet or smartphone to search online for health information and that 90% would use online services to contact health care professionals. Estimates showed that worldwide there are 1 billion smartphones and 100 million tablets in use. Research by Proudfoot, Parker, Hadzi et al. (2010) revealed that 76% of respondents expressed interest in using their phone for self-management and self-monitoring of MH if the service were free. Information from other sources show that in 2015 there were around 165,000 health apps and that 50% receive fewer than 500 downloads.

An article on the National Institute of Mental Health website (NIMH, 2017) entitled "Technology and the future of mental health treatment" provides an overview of the potential benefits and concerns of mobile mental health support. Technology has made it easy for someone to contact a crisis center. It is possible for sensors within the device to detect changes in the behavior of the individual. News accounts have illustrated how smartphone data has and is being used to track the travel of the user to identify points of contact both within a community and across the U.S. as a way of understanding the spread of COVID-19. The benefits from recent technologies include convenience, anonymity, lower cost, ability to service more individuals, interest, 24-hour service, consistency of approach, introduction to basic principles, extended support, and objective data collection (NIMH, 2017). However, there are concerns: scientific evidence of effectiveness, for whom and for what, privacy, guidance, regulation, and overselling. Price et al. (2013) describe how mobile devices have the capability of both facilitating and expanding mental health care. They serve to reduce the barriers of distance (televideo), as a

means of improving education, and can facilitate the treatment process (e.g., homework and symptom monitoring).

An approach that has proven effectiveness following initial research in the late 1990s involves the use of computer-assisted cognitive behavior therapy (CCBT or iCBT) for anxiety, depression, and somatic disorders. CCBT programs generally involve a series of from 6-15 modules that are presented via the internet on a desktop, or laptop. These efforts involve some, but minimal support from a therapist. In a review of internet-delivered psychological treatments, Andersson et al. (2019) say that there are over 300 controlled trials. In their review, the authors discuss issues involved in the implementation of the technology as well as future directions. Wright et al. (2019) provide an overview of benefits from use of CCBT in clinical practice and how it can reduce the time required from the clinician. While there is evidence in support of the use of mobile apps, further research is needed. The authors provide guidance for individuals interested in recommending use of an app. An initial meta-analysis by Andrews et al. (2010) and an update by Andrews et al. (2018) show that iCBT is an effective treatment approach for anxiety and depressive disorders. Reviews and meta-analyses by Anderson et al. (2014) and Carlbring et al. (2018) have demonstrated that internet-based CBT is equally effective as face-to-face CBT.

Many of the technological issues described in the NIMH article are being addressed in journal articles focused on the benefits associated with the use of smartphone apps. Donker et al. (2013) revealed that there is little research evidence in support of mobile mental health (MMH) apps. Their review found only 5 apps where there was evidence from randomized clinical trials. A later search of Apple and Google apps revealed that none of those apps were currently in the store. In a longitudinal study, Larsen et al. (2016) found that while 75% of the Android apps and 90% of the iOS apps were still available after 246 days, 50% of those focused on depression were no longer present after 130 days. Of the 347 depression apps, 9 claimed clinical effectiveness and only 3 cited a published study. In an ensuing investigation, Larsen et al. (2019) took a more in-depth look at scientific evidence for the top 73 mental health apps. A concern is that a third referred to techniques for which they could find no supportive evidence. Larsen et al. (2016) in their review of apps that referred to suicide or deliberate self-harm found that some of the many suicide prevention apps have elements of best practice, however, none provide "comprehensive evidence-based support." They also identified some apps with "potentially harmful content." Leigh & Flatt (2015) show that of the 27 mental health apps that were then listed in the NHS app library, only 14 were focused on anxiety and depression. Of that group, only four provided evidence of patient-reported outcomes. Only two provided evidence of patient-reported outcomes.

However, there are studies available that demonstrate the effectiveness of certain mental health applets. Firth et al. (2017) conducted a meta-analysis review of randomized clinical trials where telephone apps were used to reduce the symptoms of anxiety (sub-clinical or diagnosed anxiety disorders). Following a thorough review of more than 893 articles, the authors analyzed 9 independent samples. They reported a significantly greater reduction in total anxiety scores for those using the smartphone intervention versus those in the control conditions. Of the apps included in the review, only four were currently available to the general population (Flowy, myCompass, SuperBetter, and LivingSMART). Results revealed that three applications had no

effect. The discussion points to the further need for research to better understand the features of an app that best support anxiety reduction and whether there could be widespread use of the apps without clinical support. Alyami et al. (2017), as part of a systematic review of Apple, Android, and Windows platforms, found 1,154 apps with some relevance for social anxiety. Following a screen and removal of duplicates they evaluated 38 apps. Most failed to identify their organizational affiliation (92%). One paid app was affiliated with Mayo Clinic. The most common purposes for the apps included psychoeducation (34%), symptom management (13%), and treatment (10%). As part of the literature review, the authors could not find any documentation of the effectiveness of the apps identified in the study. They were able to identify a study that supported the effectiveness of a mobile-based CBT app for social anxiety.

Anguera et al. (2016) showed how it is possible to conduct a remote mobile randomized clinical trial (RCT) using two apps (a cognitive intervention video game and an app based on evidence-based treatment for depression). Outcome data was collected over 12-weeks. A total of 1,098 individuals from across the U.S. were involved in the study. As with any treatment activity, adherence declined across the 12-week assessments (66% completed four weeks, 50% eight weeks, and 33% 12 weeks). Results revealed that it is possible to conduct an RCT remotely, in a brief time, with minimal expense, compared to traditional approaches. Fuller-Tyszkiewicz et al. (2018) reported on the conduct of a usability test using the BlueWatch mobile app that involves a cognitive behavioral therapy for depression. While users rated both the quantitative and qualitative assessments highly, experts were concerned about difficulties regarding the amount and layout of the content. The application did encourage engagement. Based on the benefits associated with mindfulness on wellbeing, Mani et al. (2015) conducted a systematic review of mindfulness-based iPhone mobile apps. From a list of 560 identified apps, only 23 met the criteria of providing mindfulness training. A four dimension (engagement, functionality, visual aesthetics, and information quality) Mobile Apps Rating Scale (MARS) was used to evaluate each of the apps. On a five-point scale, the median score was 3.2. The highest rated apps included Headspace (4.0), Smiling Mind (3.7), iMindfulness (3.5) and Mindfulness Dailey (3.5). While the rating scale provides a sign of the overall quality of the apps, it does not provide evidence of the user-centered nature of the design of the app or the extent to which the app involves an evidence-based approach. On a more positive note, Bakker et al. (2016) identified benefits from Cognitive Behavioral Therapy (CBT) in resolving a range of common psychological problems. They indicate that "research has already demonstrated that CBT-based self-administered computerized interventions are successful for improving depression and anxiety symptomatology in adults (p.5/53)." It is possible that similar benefits can be obtained through mental health apps that have a strong CBT component. Using a checklist of 16 dimensions they provide a review of 27 iOS apps. Limitations of existing approaches were identified, and recommendations were made to guide the development of new apps.

Questions have been raised about the adequacy of how apps are listed in various app stores because many may not be relevant, based on their content. Others have expressed concerns about the evidence-based nature of many of the apps as well as their overall effectiveness. The above review and added references in the literature provide a general sense of app development and review. Stoyanov et al. (2015) developed a Mobil App Rating Scale (MARS) that could be used to evaluate health apps. Ratings are provided about engagement, functionality, aesthetics, information, and subjective quality. Further research is necessary to determine the suitability and

reliability of this approach. Any recommendation should consider the (1) availability, (2) is the approach evidence-based, (3) is there evidence of a scientific study of the effectiveness of the app, and (4) how compelling is the approach. Schnall (2018) described the conduct of a validation of an HIV symptom management app using a four factor Health Information Technology Usability Evaluation Scale (Health-ITues) that assess (impact, perceived usefulness, perceived ease of use, and user control). Information is also supplied from use of a three factor Post System Usability Questionnaire (PSSUQ). Henson et al. (2019) conducted a review of efforts to define approaches to evaluation of mobile apps and proposed a five-level app evaluation framework (background information, privacy, and security, evidence-based, ease of use, and data integration). The pyramid shape of the evaluation was used to remind users that if the app does not satisfy the lowest level they should not continue. Further work is needed to develop universal standards for app evaluations.

Efforts are underway to identify an app that can be used by pilots. Cahill et al. (2020) describe a five-year research effort focused on the development of a revised checklist and tools designed to help pilots evaluate their work-related stress (WRS) and wellbeing. The effort is described as the "advancement of phone apps with different wellness functions." Information gained from structured interviews, a literature review, workshops, a modeling effort, and two pilot surveys has already been published. The "Lived Experience Model" was developed to illustrate the relationships between multiple factors that contribute to pilot well-being. Information provided in the document illustrates elements of the app prototype. The authors recommend that additional training is needed to help pilots/aviation workers develop improved coping skills. A wellness focus throughout the organization will support safety and efficiency.

APP Recommendations from Several Sources. While this is not meant to be a thorough review of the list of websites that have conducted some type of a review of the mental health apps and generated a list the "best" apps, a list of several such sites is provided. As you can tell, there is some overlap. Since this list and downloads was prepared several months ago, there may be sections and apps that are no longer available.

(1) VeryWellMind – The 7 Best Mental Health apps of 2020.
https://www.verywellmind.com/best-mental-health-apps-4692902

- Best overall - Moodfit
- Best for learning coping skills – MoodMission
- Best for therapy – Talkspace
- Best for stress relief – Sanvello
- Best for meditation – Headspace
- Best for fun – Happify
- Best for depression – Depression CBT Self-Help Guide

(2) Psychiatry Advisor -
https://www.psychiatryadvisor.com/slideshow/slides/top-10-mental-health-apps/

1. SAM – Self-help for Anxiety Management (Free on android and IOS devices)
2. Intellicare – Suite of apps for depression and anxiety (Free for android devices)
3. Equanimity – A meditation timer ($4.99 on IOS devices)

4. Code Blue – For teenagers struggling with depression or bullying (Free)
5. Breathe2Relax – For stress management (Free)
6. Talkspace – Make therapy more available by messaging with one of 200 therapists (Android and IOS with weekly to annual charge, $49/week to $624/annual)
7. Big White Wall – Community application where individuals suffering from mental illness can come together people can come together to talk about their problems with a trained therapist (includes articles, self-assessment tests, and discussion boards). Cost is around $36.60 and is available for both IOS and Android devices)
8. Lantern – Web and mobile-based platform for providing cognitive behavior therapy (CBT) techniques with support from experts. User assessment is used to provide daily exercises. Cost ranges from $75 a month to $398 per year. Available on IOS devices.
9. PTSD – App developed by the Department of Veterans Affairs' National Center for Post-Traumatic Stress Disorder. For military personnel, veterans, and civilians. Contains a self-assessment tool and ability to track symptoms across time. (Free for IOS and android devices)
10. Optimism – Family of applications that serve as a self-tracking tool for coping with mental illness (mood, triggers, and wellness planning). Download on MAC, IOS, Windows and various browsers.

(3) **Psycom** highlights the best mental health apps for 2020 and experts weigh in about just how effective they are as an alternative treatment**.** Article by: **Jessica Truschel** **https://www.psycom.net/25-best-mental-health-apps**

1. notOK – suicide prevention app, iOS, android, free,
2. What's up – Cognitive Behavioral Therapy (CBT) app for depression, anxiety, stress, iOS, android, free,
3. MoodKit – CBT with 200 different mood improvement activities, iOS $4.99,
4. Twenty-Four Hours a Day – addiction app offers 366 meditations, iOS $5.99, android,
5. Quit That!, free, iOS,
6. Mind Shift – for teens and young adults, anxiety, free, iOS, android,
7. Self-Help for Anxiety Management (SAM) – build your own 24-hour anxiety kit, iOS, android, free,
8. CBT Thought Record Diary – CBT thought record diary, iOS, android, free,
9. IMoodJournal – personal journal and mood tracker, $2.99, iOS, android,
10. eMoods – mood tracking app, iOS, android, free,
11. Talkspace Online Therapy – text message a therapist as often as needed, $65-$99/wk. iOS, android,
12. Happify – psychologist-approved mood-training, iOS, and android, free,
13. MoodTools – CBT for modifying thoughts involved in depression, iOS, android, free,
14. Recovery Record – recovery from eating disorder, free, iOS, android,
15. Rise Up and Recover – track meals and how you feel, iOS, android, free,
16. Lifesum – improve healthy living, iOS, android, free,
17. nOCD – mindfulness and exposure response prevention treatment for OCD, iOS, free,
18. Worry Watch – identify trigger points for anxiety, iOS, $3.99,
19. GG OCD – awareness of negative thoughts and training to change, iOS, free,

20. PTSD Coach – developed by the VA's National Center for Post-Traumatic Stress Disorder, iOS, android, free,
21. Breathe2Relax – portable stress management tool, iOS, android, free,
22. UCSF Prime – social network for people with schizophrenia, iOS, android, free,
23. Headspace – learn skills of mindfulness and meditation, iOS, android, $12.99/mo. or $99.99/yr.,
24. Calm – guided meditations, etc., iOS and android, $112.99/mo.,
25. Ten Percent Happier – library of 500+ meditations, iOS, android, $12.99/mo.

(4) IntelliCare: Mental Health Apps for the 21st Century

IntelliCare is a suite of apps that work together to target common causes of depression and anxiety like sleep problems, social isolation, lack of activity, and obsessive thinking. These apps are part of a nationwide research study funded by the National Institutes of Health.

https://intellicare.cbits.northwestern.edu

(5) PsyberGuide | A Project of One Mind | A Mental Health App ...

PsyberGuide is a non-profit website dedicated to consumers seeking to make responsible and informed decisions about computer and device-assisted therapies for mental illnesses. **PsyberGuide** is also intended for professionals and researchers seeking to enhance their knowledge in this area.
The guide has a section called "Help me find an App." There is a list of specified conditions or treatment types along with evaluations of 177 apps. Each app is rated on a five-point scale with respect to the credibility and user experience. Information is also provided regarding transparency and whether an expert review is available.

https://www.psyberguide.org

(6) The United Kingdom Health Service

Provides extensive information on the website regarding mental health and available services. They provide a list of mental health apps that have met certain criteria. However, Leigh & Flatt (2015) point out that of the 27 apps that were accessed in 2015, only 4 of the 14 focused on depression and anxiety provide evidence of "patient-reported outcomes." On 4/26/2020, the website https://www.nhs.uk/apps-library/category/mental-health/ contained the following list. Information is provided regarding the cost associated with each app.

1. Be mindful,
2. Beat panic,
3. Big White Wall,
4. Blue Ice,
5. Calm Harm,
6. Catch It,
7. Chill Panda,

8. Cove, (8) distract,
9. eQuoo: Emotional Fitness Game,
10. Feeling Good: positive mindset,
11. Leso,
12. MeeTwo,
13. My Possible Self: The Mental Health App,
14. Silver Cloud,
15. Sleepio,
16. Sleepstation,
17. Stress & Anxiety Companion,
18. Student Health App,
19. Thrive,
20. Worry Tree

(7) HealthLine

Provides a list of the best Depression apps for 2019. For each app there is a brief description, ratings for iPhone and android versions, and information regarding the price.

1. Moodpath – Depression & Anxiety Test,
2. TalkLife,
3. Daylio – Mood Tracker,
4. Youper,
5. Depression CBT,
6. What's Up,
7. Pacifica,
8. Happify.

https://www.healthline.com/health/depression/top-iphone-android-apps

Summary - Where do we go from here?

This review clearly illustrates the extensive information available regarding the impact of COVID-19 and available resources to address the psychological distress that individuals may experience. It also identifies the need for individual support to address the psychological concerns associated with the pandemic. NOTE: Information provided by various sources are continually being updated. References to websites may have changed across time.

- There is little question that the presence of the pandemic has caused many individuals to experience increased psychological distress.
- The approach to reducing the impact of the coronavirus in the U.S. has been inconsistent at multiple levels.
- Information contained on social media has served to spread information that directly conflicts with recommendations from the CDC and other medical professionals.
- Aviation and other personnel need to be encouraged to carefully review available information and attend to recommendations provided from reputable sources.
- Research has demonstrated that individuals who have lost their jobs and/or are experiencing mental health difficulties require immediate support.

- Pilot, flight attendant, and other support groups can provide valuable support during the pandemic.
- Efforts are needed to ensure that peer support programs are available for all aviation workers.
- There is a wealth of information available on the WWW to help individuals cope more effectively with the psychological stress associated with the pandemic. However, the user needs to ensure that the source of the information is reliable and that the recommendations have a solid scientific basis.
- There is sufficient information available to support the use of mental health Apps. The brief review reveals some of the difficulties associated with identifying the apps that have a solid scientific basis and are evidence-based. Regarding anxiety and depression, the review suggests that apps that involve CBT are likely to be more beneficial.
- As with any effort to modify one's behavior, the reduction in psychological distress will require a concerted effort across time and attention to lifestyle and wellbeing.
- Remember, coping starts with the individual, follow the guidance provided by the CDC and other sources:
    - Take breaks from listing or reading new stories about the pandemic
    - Take care of your body
        - Take deep breaths, stretch, or meditate
        - Try to eat healthy, well-balanced meals
        - Exercise regularly
        - Get plenty of sleep
        - Avoid alcohol and drugs as a coping mechanism
    - Make time to unwind – try to do some other activities you enjoy
    - Connect with others – talk with people you trust about your concerns and how you are feeling
- If the distress is sufficient, we encourage the individual to contact a mental health professional.
- Aviation organizations and regulators need to rethink their objectives relative to the importance of employee wellbeing.
- Aviation organizations need to place greater emphasis on the importance of employee wellbeing and provide the necessary information and tools to support employee self-care.
- Efforts to provide the necessary organizational resources and reduce the job demands will improve efficiency and safety.

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