OPERATIONAL CONSIDERATIONS FOR VOLUNTARY PILOT ORGANIZATIONS IN RESPONSE TO COVID-19

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Many if not all volunteer pilot organizations (VPOs) in the United States have curtailed or eliminated passenger flights in order to reduce the potential for transmission and spread of the novel coronavirus SARS-CoV-2, the cause of the pandemic of COVID-19 (**CO**rona**VI**rus **D**isease 20**19)**. As the nation moves toward partial relaxation of guidelines to prevent transmission, VPOs may consider modifying their current policies and procedures. There is broad consensus that VPOs provide essential services, which should influence their operations.

Transmission Risk

Evolving data are beginning to provide clarity on the mechanisms of coronavirus transmission and its prevention. While some infected persons generate aerosols of respiratory particles that test positive for the virus, available evidence is that the large majority of transmissions occur by exposure to droplets or relatively large aerosol particles expelled by infected persons during coughing, sneezing, or speech.[*] The assays employed to identify SARS-CoV-2 detect the virus's genetic material (RNA).[+] The polymerase chain reaction (PCR) tests for RNA detection are extremely sensitive, capable of detecting extremely small amounts, and a positive result does not necessarily denote intact virus capable of initiating infection in exposed persons. Even when intact virus is present, the amount may be too small to allow transmission. Hence, positive virus testing in the air or in the environment (and for that matter, in a person who has recovered from COVID-19) denotes a potential but not a certainty of transmission risk for exposed persons. In addition, the "viral load"—the amount of virus present in an infected person and thus that person's potential to expel infectious droplets or aerosols—varies widely. Viral load usually is highest in persons soon after acquiring the infection, often before symptoms begin, and then declines over the next several days.

Evidence that most virus transmissions occur from exposure to droplets (or relatively large aerosol particles) is that physicians, nurses and other providers of direct care for COVID-19 patients have low rates of infection when wearing personal protective equipment (PPE) to prevent droplet exposure but which provide little or no protection against aerosols. Specifically,

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[*] Droplets are defined as particles sufficiently large to rapidly settle out of the air, and aerosols as smaller particles that circulate in the air. In fact, there is a range of the sizes of respiratory fluid particles that may be expelled, how far they may travel before settling, and the distances over which the virus may be transmitted.[1] Nonetheless, the droplet/aerosol dichotomy has proved useful in predicting transmission risk.

[+] The genes of most viruses, like those of all animals and plants, are composed of DNA (deoxyribonucleic acid). The genes of some viruses, including coronaviruses, are composed of RNA (ribonucleic acid).

gowns, gloves, surgical masks and often face shields provide nearly complete protection.[#] Aerosol prevention, which includes high filtration (N95) masks or a self-contained air supply such as a powered air-purifying respirator (PAPR), is employed when performing medical procedures likely to produce aerosols of infected fluids, such as inserting an endotracheal breathing tube in a patient starting mechanical ventilation. In addition, the dramatic declines now being observed in many communities because of 6 foot social distancing and face coverings are indirect evidence that aerosol transmission is infrequent. Although the benefits of surgical masks or other lower face coverings initially were uncertain and controversial, among infectious diseases specialists there is now consensus that by limiting the expulsion of droplets by coughing, sneezing or speaking, they reduce transmission risk by infected persons.

It is imperative to understand that aerosol transmission clearly occurs from time to time and likely explains some well publicized local outbreaks, such as one involving a church choir in Washington State. However, such events appear to be unusual and probably account for a small proportion of all COVID-19 cases. As total transmission events are reduced in frequency by avoidance of droplet exposure and physical contact, the proportion of cases attributed to less direct transmission (e.g. by aerosol) necessarily rises, even as total infections decline—something to keep in mind in interpreting media reports. Avoiding direct contact with infected persons with symptoms, especially coughing or sneezing, undoubtedly provides substantial (although incomplete) protection against infection.

Limiting Transmission Risk in Aircraft

Two documents available to the aviation community address COVID-19 prevention, including aircraft environmental characteristics that might influence transmission.[2,3] Most general aviation aircraft do not permit 6 foot distancing for all occupants. However, the data against frequent virus transmission by aerosols increases confidence that transmission risk may nevertheless remain low. The probable high rate of air exchange in small general aviation aircraft also might reduce whatever risk exists from aerosol exposure. All pilots, whether or not in VPO operations, have responsibilities, as pilots in command, to maximize the safety of all aspects of flight and to strike a balance between risks and benefits. In addition to such traditional aspects as weather, terrain, fuel management, aircraft maintenance, and pilot health, PIC responsibilities now include assessment of the risk of coronavirus transmission and its prevention, and balancing these with operational priorities.

Reasonable precautions for pilots and passengers (other than the pilot's personal household members) include:

- Exclusion of persons with symptoms consistent with COVID-19, including but not limited to cough, sneezing, chest congestion, shortness of breath, fever, and loss of taste or smell; optionally, pilots may consider adding temperature screening with a non-contact thermometer
- Exclusion of persons with known exposure to a COVID-19-infected person within the preceding two weeks, including persons who have been notified of possible exposure through contact tracing
- Exclusion of persons who have traveled recently to geographic areas with high infection rates, and others potentially at high risk

[#] An as yet unpublished study of 2,300 University of Washington medicine personnel showed about 4% to have COVID-19, with no difference between those who provided direct care to patients—including COVID-19 patients while using droplet but not aerosol precautions—compared with those not in direct contact with patients. These results suggest that most or all were infected in the community and not from infected patients. Other health care facilities have had similar experiences.

- Limiting the number of travelers to the extent possible, because each additional person on board in principle raises the risk for all occupants
- Requiring all occupants to wear surgical masks or other suitable face coverings
- Avoiding direct personal contact between aircraft occupants, such as shaking hands, hugging or other physical contact
- Washing hands or using hand sanitizer by all occupants immediately before boarding
- Optionally, wearing protective gloves when handling other persons' luggage or other personal equipment; or washing hands or applying sanitizer after such contact and prior to boarding
- Optionally, wearing gloves when handling cargo
- Maximizing air exchange in the cabin, to the extent compatible with aircraft limitations and passenger comfort
- Consideration of local or regional COVID-19 frequency, if accurate information is available from local health authorities; for example, pilots may have different standards for passengers from communities with especially high versus low rates of infection
- At the conclusion of each flight, cleaning potentially contaminated objects and surfaces with disinfectant wipes or solution, including headsets, seat belt buckles, arm rests, door handles, etc.

As accurate and reliable testing for current or past infection becomes available, and perhaps especially when rapid point-of-care tests are available, current infection (e.g. positive RNA test by PCR) usually will preclude travel. In the not too distant future, serological (antibody) testing may be available to accurately identify persons who are susceptible versus immune to infection. Finally, pilots and aircrew should consider their own risks in the event they acquire COVID-19, especially older age or underlying medical conditions known to enhance risk.

Conclusion and Recommendations

Absolute assurance of no SARS-CoV-2 transmission risk during passenger flights is not possible in the foreseeable future. However, VPOs provide essential services, many of which not only bring direct benefit but also will ameliorate the societal impact of COVID-19. VPOs need not adopt more stringent protections than those employed by other comparable agencies and services. For example, as medical institutions relax their restrictions of non-emergency health care, VPOs serving such patients should not have more restrictive policies and procedures than the clinics and practitioners providing that care.

Accordingly, VPOs should ensure that their pilots and aircrew members have the latest information pertinent to flight safety, and recommend procedures to maximize infection prevention consistent with authoritative recommendations from public health agencies and other relevant experts. They should emphasize COVID-19 prevention as a critical component of aviators' PIC responsibilities. Under these conditions, VPOs can thoughtfully and judiciously resume passenger services with a reasonable balance between their missions and the safety of their pilots and beneficiaries.

ADDENDUM

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Evolving data indicate that increased time in closed environments with limited air circulation may enhance risk of transmitting SARS-CoV-2 if an infected person is present,[4] with potential implications for small GA aircraft. At the same time, other information suggests that maximizing

air circulation reduces risk, as indicated by the absence of reported virus transmission out of doors.[5] While no data yet exist on actual transmission risk in small GA aircraft, logical extrapolation supports:

- As indicated previously, maximize air exchange in the cabin, consistent with temperature control and other aspects of passenger comfort.
- For single-pilot aircraft, avoid side-by-side seating by preferentially placing passengers in the second or third row, leaving the right front seat unoccupied.

References

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2. Masys D, Handsfield HH. COVID-19 Effects on Volunteer Pilot Organizations. http://faculty.washington.edu/dmasys/COVID19_considerations_for_VolunteerPilotOrgs.pdf
3. Masys D. Thoughts on Restarting VPO Passenger Carrying Operations. http://faculty.washington.edu/dmasys/RestartingVPOoperations.pdf
4. Bromage E. The Risks—Know Them—Avoid Them. https://www.erinbromage.com/post/the-risks-know-them-avoid-them
5. New York Times. What We Know About Your Chances of Catching the Virus Outdoors. https://www.nytimes.com/2020/05/15/us/coronavirus-what-to-do-outside.html

Background Resources

Centers for Disease Control and Prevention. Coronavirus (COVID-19). https://www.cdc.gov/coronavirus/2019-nCoV/index.html

University of Washington. Novel Coronavirus & COVID-19: Facts and Resources. https://www.washington.edu/coronavirus/

Infectious Diseases Society of America. COVID-19 Resource Center. https://www.idsociety.org/public-health/COVID-19-Resource-Center/

About the Author

H. Hunter Handsfield, MD received his medical degree from Columbia University and residency and specialty training in infectious diseases at the University of Washington. He is board certified in internal medicine and infectious diseases and spent a forty year career with Public Health – Seattle & King County and the University of Washington School of Medicine, where he is Professor Emeritus of Medicine. Residing in Seattle, the first COVID-19 epicenter in the United States, Dr. Handsfield has closely monitored UW and PHSKC policies and procedures in response to the pandemic. He has 3,700 flight hours, primarily in his turbocharged Cessna 182, is a volunteer pilot for Angel Flight West https://www.angelflightwest.org, formerly served on AFW's Board of Directors, and is a consultant to AFW on infection control policies and procedures.