

FAA Center of Excellence for Technical Training and Human Performance

COVID-19 – Research Ideas for Pandemics

1) BLI/Program: FAA Administrator, FAA HR, and FAA CAMI

Project: Safe Access for Employees to FAA Federal Facilities and Field Sites During Pandemics

Funding Need: \$450,000

Description: The purpose of this study is to determine the feasibility of utilizing current technology (remote medical interface; Fitbit etc.) to quickly determine critical employee data such as temperature and other applicable information prior to allowing access to FAA Facilities during a pandemic situation. Results of the study include recommendation of a current technology that could be easily implemented to enable FAA employees to be quickly screened prior to entrance at facilities during a pandemic saturation.

- Covid-19 Justification: The project will assist the FAA in its response to COVID-19 and future pandemics by enabling the agency to insure a safe and healthy workplace and allowing additional employees to return to the workplace as needed lessening risk of exposure.
- Research Team: TBD – University of North Dakota, University of Nebraska-Omaha, and University of Oklahoma in collaboration with medical schools

2) BLI/Program: FAA ATO

Project: Feasibility of High and Low Fidelity Remote/Virtual Training Solutions for FAA Air Traffic Controllers Due to Workforce Impacts During Pandemics

Funding Need: \$350,000

Description: The purpose of this study is to validate the skills and performance level outputs of En Route, Tracon, and Tower ATCs using remote and virtual training solutions (e.g. mobile apps, AR training, VR gaming, online learning, etc.) during a crisis such as a pandemic. A gap analysis will be conducted to identify areas for improvement of training curricula and technology. The results of this study include training recommendations and data for FAA review to ensure training outputs meet standards and ensure safety of the NAS.

- Covid-19 Justification: Impacts to ATC training, more remote training during pandemics.
- Research Team: Dr. Tom Petros, Paul Drechsel, and Craig Carlson, University of North Dakota

3) BLI/Program: FAA ATO

Project: Feasibility of Remote/Virtual Training Solutions for FAA Technicians Due to Workforce Impacts During Pandemics

Funding Need: \$250,000

Description: The purpose of this study is to validate the skills and performance level outputs of technicians using remote and virtual training solutions (e.g. AR training and online learning, etc.) during a crisis such as a pandemic. A gap analysis will be conducted to identify areas for improvement of training curricula and technology. The results of this study include training recommendations and data for FAA review to ensure training outputs meet standards and ensure safety of the NAS.

- Covid-19 Justification: Impacts to technician training, more remote training during pandemics.
- Research Team: TBD - University of North Dakota and Western Michigan University

4) BLI/Program: FAA ATO

Project: Ensuring Appropriate Levels of Engagement Among Air Traffic Control FAA Academy and Entry-Level Field Facility Trainees via Remote Training Solutions During Pandemics

Funding Need: \$400,000

Description: The purpose of this study is to identify instructional design methods essential to effective remote learning. Results will include recommendations for ensuring adequate engagement between trainees and trainers as well as best practices for remote technologies and training materials. The study will also focus on the importance of diversity and inclusion in the practices used for staffing remote trainers and standards for curricula.

- Covid-19 Justification: Assist FAA with remote training for ATCs during pandemics.
- Research Team: Dr. Todd Hubbard and Dr. Ned Reese, University of Oklahoma, Dr. Chen Ling, University of Akron, and Dr. Becky Lutte, University of Nebraska-Omaha

5) BLI/Program: FAA ATO

Project: Implementation of Remote EnRoute, Tracon, and Tower Air Traffic Control Staffing Solutions During Pandemics

Funding Need: \$300,000

Description: The purpose of this study is to determine the protocol for deploying a remote staffing solution as a contingency plan for EnRoute, Tracon, and Tower ATC operations during pandemics. This includes an evaluation of the use of advanced technologies (e.g., artificial intelligence) and subsequent training on use of the technologies critical to enhancing ATC operations. The study will also focus on prevention of fatigue of staff to prevent impact to performance.

- Covid-19 Justification: Assist FAA with remote operations to maintain staffing during pandemics.
- Research Team: Dr. Robert Dionne, Dr. Robert Wood, Stephen West, and Jeff Tyrcha, University of Oklahoma and Caroline Ocasio, InterAmerican University

6) BLI/Program: FAA ATO

Project: Standardization of Remote ATC Field Training During Pandemics

Funding Need: \$400,000

Description: The purpose of this study is to build upon the original FAA COE TTHP field training standardization study by identifying areas for common curricula and remote training sharing among facilities across the U.S. Results will include protocol for standardizing training and sample lessons to include recommendations for training technology.

- Covid-19 Justification: Assist FAA with remote training standardization for ATC field facilities.
- Research Team: Dr. Robert Dionne, Dr. Robert Wood, Stephen West, and Jeff Tyrcha, University of Oklahoma and Caroline Ocasio, InterAmerican University

7) BLI/Program: FAA ATO, FAA HR, and FAA CAMI

Project: Impact on Crew Resource Management in Remote ATC Towers During Pandemics

Funding Need: \$450,000

Description: The purpose of this study is to determine what the impact is on crew resource management when forced to operate in the remote tower and with a limited staff environment due to pandemics. A best practices report will be developed to document experience from COVID-19. A recommendations report will be developed for crewing and resources required to address contingency planning and changes to the training environment.

- Covid-19 Justification: The project will assist the FAA in its response to COVID-19 and future pandemics by: Providing research and information to best determine how facilities can continue to safely operate when staff or facility limited.
- Research Team: Dr. Robert Dionne, Ken Carson, Stephen West, and Jeff Tyrcha, University of Oklahoma

8) BLI/Program: FAA ATO and Airline Corporations

Project: Evaluating the Use of Personal Protective Equipment for ATCs, Technicians, Pilots, and Airline Crew to Maintain Adequate Staffing Levels During Pandemics

Funding Need: \$350,000

Description: The purpose of this study is to evaluate personal protective equipment (e.g., gloves, masks, respirators, sanitizer, keyboard covers, etc.) and develop a safety plan for use by ATCs, TechOps, Pilots, and Airline Crew personnel. Based on the results of the evaluation, make recommendations for safer operations during future pandemics including essential equipment lists, procedure documents, and training to be able to perform tasks when using the personal protective equipment.

- Covid-19 Justification: Improve the safety of aviation personnel.
- Research Interest: TBD - University of North Dakota, University of Nebraska-Omaha, Auburn University and the University of Oklahoma

9) BLI/Program: FAA ATO and FAA CAMI

Project: Impact of Pandemics on Human Factors and Performance of FAA Air Traffic Controllers and Technicians

Funding Need: \$500,000

Description: The purpose of this study is to assess the human factors impact to the work performance of ATCs and technicians during a pandemic as well as incorporate lessons learned from the current outbreak for addressing pandemics in the future. This includes the evaluation of physiological and psychological strains on employees (such as fatigue) as it influences risk-based decision making. Results of this study will enhance existing FAA contingency plans for ATO training and technological enhancements to aid human performance. In addition, the study will include the development of a mitigation plan for FAA management and operational staff. Results will also contribute to recommendations for front line managers to provide HR support for ATC and technician staff.

- Covid-19 Justification: Impacts to ATC and technician training, more remote training during pandemics.
- Research Interest: Dr. Julius Keller, Dr. Flavio Coimbra Mendonca, and Dr. Brandon Pitts, Purdue University, Dr. Tom Petros, Paul Drechsel, Craig Carlson, University of North Dakota and Dr. Todd Hubbard, Dr. Ziho Kang, Stephen West, University of Oklahoma in collaboration with the OU Health Sciences Center

10) BLI/Program: FAA ATO and FAA HR

Project: Impact of Staff Limitations on FAA Air Traffic Control Field Facilities and FAA Technical Operation Field Facilities During Pandemics

Funding Need: \$350,000

Description: The purpose of this study is to examine the impact of staff limitations of the seasoned workforce during a pandemic for ATCs and technicians. This includes the feasibility of utilizing assistance from the military and collegiate programs to ensure adequate staffing at lower level traffic facilities and operations as well as the feasibility of transitioning higher performing staff to high level traffic facilities.

- Covid-19 Justification: Impact to staffing more remote training during pandemics.
- Research Team: Dr. Robert Dionne, Dr. Robert Wood and Lindy Ritz, University of Oklahoma and Paul Drechsel and Craig Carlson, University of North Dakota

11) BLI/Program: FAA HR, FAA Flight Standards, and Airline Corporations

Project: Identifying Best Practice Protocols and Procedures for Conducting Safe Flight Operations During Pandemics

Funding Need: \$500,000

Description: The purpose of this study is to analyze the flight operations and transportation practices used during COVID-19. This includes developing a best practices guide for future pandemics with protocols for constituting essential flight routes and well as identifying procedures for dealing with passengers, protection of aircrews, and how to deal with transportation of sick passengers. In addition, the study will test the use of health equipment such as COVID-19 filter masks and technology such as sensors and artificial intelligence to be deployed at both the airport facilities as well as inside the aircraft cabin to rapidly identify, prevent, and or address any health risks to the airline crew.

- Covid-19 Justification: Lessons learned from COVID-19 for future safe flight operations during pandemics.
- Research Team: Dr. Robert Dionne, Dr. Rockee Zhang, Dr. Christan Grant, Dr. Yingtao Liu, Captain Scott Shankland, and Jeff Tyrcha, University of Oklahoma in collaboration with the OU Health Sciences Center (use OU, UND, UNO, and Auburn as test sites for experiments); Dr. Shawn Pruchnicki, University of Nebraska-Omaha

12) BLI/Program: FAA ATO

Project: Applying Data Visualization and Analytics Towards Understanding the Impact of Pandemics on Air Traffic System Performance

Funding Need: \$350,000

Description: The impacts of a pandemic on air traffic system performance is wide reaching yet limited in understanding. Pandemic induced scenarios include forced reductions in flight routes to prevent pandemic spread, reduction in air traffic facility capacity due to infections, and forced consolidation of air traffic routes. Data visualization and analytics on air traffic system operations during pandemic situations will be analyzed with the goal of providing a better understanding of pandemic impacts and strategies for mitigation, and eventual recovery, of system performance.

- Covid-19 Justification: The ATC system has already seen impacts, due to drastically decreased system demand, and also closure of air traffic towers at otherwise busy airports. This research will help with mitigating performance degradations due to these effects.
- Research Team: Dr. Seth Young, The Ohio State University and Dr. Chen Ling Akron University

13) BLI/Program: FAA ATO, FAA HR, FAA NextGen, FAA CAMI, FAA Commercial Space Transportation Project: Computational Architecture for Multi-Task Performance of the FAA Workforce in Human-Machine Systems

Funding Need: \$400,000

Description: Before the FAA commit funds to solve training and operations challenges through the creation of new simulators and other hardware during the pandemic, a systems approach, using the below mentioned architectures, could save the government millions in R&D costs. The purpose of this study is to test the viability of computational architectures of Adaptive Control of Thought-Rational (ACT-R) theory, Queuing Network-Model Human Processor (QN-MHP) and Explicitly Parallel Instruction Computing as possible gateways to creating preproduction systems analysis.

Liu, Feyen, and Tsimhoni (2004) posited that "the increasing complexity and cost of advanced multitask, interactive human-computer systems make it necessary for system designers to consider human capabilities and limitations as early as possible in the system design."

Liu, Y., Feyen, R., & Tsimhoni, O. (2004). Queuing network-model human processor (QN-MHP): A computational architecture for multitask performance in human-machine systems. ACM Trans. Compt.-Human Interact., 13, 37-70.

The ACT-R theory, also known as ACT, was developed at Carnegie Mellon University by Anderson in 1976.*

The cognitive processing model "studies the way that human beings learn as well as how quickly they respond [to] stimuli" (Deering, 2016). The model breaks down the mind into working memory, declarative memory, and production or procedural memory. It has been used by law enforcement and those studying artificial intelligence. Deering, C. (2016). A study of adaptive control of thought-rational theory. Theories of Communication. Publisher Unknown.

ACT has been used to study communication in air traffic control.*

- Covid-19 Justification: The project will assist the FAA in its response to COVID-19 and future pandemics by creating systems to assist training and operations for air traffic, tech ops, flight standards, maintenance, and flight ops.
- Research Team: Dr. Todd Hubbard, Dr. Dean Hougen, Dr. Christan Grant, and Dr. Ziho Kang, University of Oklahoma

14) BLI/Program: FAA ATO and Major Airline Corporations

Project: Understanding of Aviation's Contribution to the Spread of Pandemics

Funding Need: \$350,000

Description: The primary causal factor to pandemic growth is the movement of humans. The nation's aviation system transported hundreds of millions of humans in the first quarter of 2020, no doubt contributing to the global spread of the current novel coronavirus. A better understanding of the flow of humans through the aviation system would most certainly aid in creating smart air traffic mitigation strategies that would help mitigate pandemic spread. This project would apply air traffic and passenger traffic data to geo-spatial temporal data analytics methodologies to seek insights into this important topic.

- Covid-19 Justification: Understanding pandemic spread and mitigating future spread by incorporating smart air traffic strategies.
- Research Team: Dr. Seth Young, The Ohio State University and Dr. Shawn Pruchnicki, University of Nebraska-Omaha

15) BLI/Program: FAA ATO and FAA CAMI

Project: Remote Virtual Reality Training Use by Air Traffic Controllers During Pandemics

Funding Need: \$300,000

Description: This research is composed of two phases: [1] Design of the multi-person virtual reality (MVR) where the instructor and multiple trainees can join in a virtual classroom or learning space. [2] Adaptation of Universal Design for Learning (UDL) and Multimodal training methodologies to increase the training effectiveness in the MVR environment. Leverage previous studies by OU for COE TTHP.

- Covid-19 Justification: Remote training of ATCS during pandemics
- Research Team: Dr. Ziho Kang, University of Oklahoma

16) BLI/Program: FAA Flight Standards

Project: Pandemic Operations for Aviation Safety Inspectors

Funding Need: \$350,000

Description: The purpose of this study is to develop process and technology standards to allow ASI's to oversee required inspections while minimizing health risks. Potential protocols include the appropriate use of PPE where physical inspection is required, effective use of remote inspection tools (i.e. video with proper documentation to insure the ASI is signing off on correct process/procedure/equipment/aircraft), and protocols for modifying procedures specific to current/future threats to ensure the safety of senior or medically fragile personnel. Results of the study include: Process and procedure guides, standards and recommendations.

- Covid-19 Justification: The project will assist the FAA in its response to COVID-19 and future pandemics by: allowing ASIs to maintain both aviation safety and personal safety.
- Research Team: Dr. Robert Wood, Dr. Dionne, Dr. Hubbard, University of Oklahoma

17) BLI/Program: FAA Flight Program Operations

Project: Feasibility of the Immediate Use of sUAS Flight Inspection During Pandemics

Funding Need: \$400,000

Description: The purpose of this study is to finalize sUAS flight inspection for use during pandemics. Leverage existing studies from Oklahoma State and Oklahoma to complete the technology and testing.

- Covid-19 Justification: Maintain flight inspection during pandemics.
- Research Team: Dr. Jim West, Oklahoma State University and Dr. Rockee Zhang, University of Oklahoma

18) BLI/Program: FAA UAS Office

Project: Remote Training to Enhance UAS Pilots Performance of BVLOS Operations During Pandemic Deliveries

Funding Need: \$350,000

Description: The purpose of this study is to evaluate the existing BVLOS operations of UAS pilots during COVID-19 when delivering medical supplies and other critical items. The study will identify factors that contribute to risk mitigation strategies. As a result of the study, a training plan will be developed to enhance UAS pilot performance to ensure the safety of the NAS.

- Covid-19 Justification: Increase UAS pilot safety during delivery operations in pandemics.
- Research Interest: Dr. Jamey Jacob and Dr. Matt Vance, Oklahoma State University

19) BLI/Program: FAA NextGen and Major Airline Corporations

Project: Feasibility of Low and High Fidelity AR/VR Pilot Training for Collegiate and Airline Cadet Programs During Pandemics

Funding Need: \$300,000

Description: The purpose of this study is to validate the skills and performance level outputs of pilots training on low and high fidelity AR and VR technology and to determine the feasibility of new pilots entering the workforce during a crisis such as a pandemic. The results of this study include training recommendations and data for FAA review to ensure safety of the NAS.

- Covid-19 Justification: Impact to ATO staffing during pandemics.
- Research Interest: Dr. Jason Cutter, Dr. Brian Dillman, Dr. Julius Keller, Dr. Brandon Pitts, Dr. Mike Suckow, Purdue University; Dr. James Birdsong and Dr. James Witte, Auburn University; Dr. Shawn Pruchnicki, University of Nebraska-Omaha; Dr. Tom Petros and Dr. Jim Higgins, University of North Dakota; and Dr. Michael Wiggins, Dr. Robert Thomas, and Dr. Tyler Spence, ERAU – Daytona

20) BLI/Program: FAA CAMI and Major Airline Corporations

Project: Impact of Pandemics on Fatigue and Performance of Airline Pilots and Crew

Funding Need: \$600,000

Description: The purpose of this study is to determine health procedures for the safety of pilots and crew during a time of pandemics. This includes a protocol for issuing vaccines, health checks, fatigue, and performance monitoring.

- Covid-19 Justification: Health and performance impacts to pilot and crew during pandemics.
- Research Interest: Dr. Tom Petros, Dr. Mark Dusenbury, Dr. Jim Higgins, University of North Dakota; Dr. Scott Tarry and Dr. Shawn Pruchnicki, University of Nebraska-Omaha; Dr. Flavio Coimbra Mendonca and Dr. Julius Keller, Purdue University; Dr. Todd Hubbard, University of Oklahoma; and Dr. Erin Bowen, ERAU - Prescott

21) BLI/Program: FAA Flight Program Operations, FAA Flight Standards, FAA CAMI, FAA HR, Airline Corporations

Project: Lessons Learned, Best Practices, and Reestablishing Post-Pandemic Commercial Air Travel: Airport Operations and Passenger Perspectives

Funding Need: \$300,000

Description: The purpose of this study is to determine how confidence will be restored in the air transportation system through the lens of airport operations personnel and passengers. Beginning as soon as possible, a longitudinal study will be conducted that consists of interviews with airport managers to understand the impacts COVID-19 has had on their operations, the resulting changes in operations, and the lessons learned which can be applied in the future as best practices. Simultaneously, a longitudinal survey will be conducted with passengers through various channels to measure passenger confidence in returning to commercial aviation throughout and after the pandemic, along with the resulting changes in their perceptions and willingness to use commercial air travel. Results of the study include: 1) lessons learned from airport operations as a result of the pandemic, 2) best practices and paths forward for airport operations, 3) passenger confidence and willingness to travel tracking, and 4) passenger perceptual changes toward commercial aviation as a result of the pandemic, along with an understanding of how to encourage their return to commercial aviation.

- Covid-19 Justification: The project will assist the FAA in its response to COVID-19 and future pandemics by understanding the lessons learned, along with newly developed best practices, from the perspective of airport operations personnel who manage the airports. Additionally, the findings will evaluate the passengers who transit airports, understanding factors influencing their willingness to return to commercial flying, and offer information on how the government and industry can work to encourage passenger's return to commercial aviation. The findings from the study could assist in expediting the return of passengers to commercial flying by tailoring messaging and communications to their areas of concern and focus.
- Research Team: Dr. Scott Winter and Dr. Stephen Rice, Embry-Riddle Aeronautical University

22) BLI/Program: FAA Airport Safety and Operations

Project: Feasibility of Utilizing sUAS to Support Safety Protocols for Airport Operations During Pandemics
Funding Need: \$400,000

Description: The purpose of this study is to test sUAS use for safety protocols during pandemics such as public announcements, disinfection of areas, security monitoring, aircraft inspection, etc. Results of this study include the development of a recommendations report outlining protocols for future use of sUAS as well as a comprehensive training plan for airport staff.

- Covid-19 Justification: sUAS use can assist with safe airport operations during pandemics.
- Research Team: Dr. Mark Askelson, University of North Dakota, Dr. Robert Huck, University of Oklahoma, and Dr. Seth Young, The Ohio State University

23) BLI/Program: FAA Policy, International Affairs, and Environment

Project: Protocol for Providing Regulatory Relief to Operators During Pandemics

Funding Need: \$250,000

Description: The purpose of this study is to examine changes to regulatory standards and practices during COVID-19 and to develop recommendations for a formal protocol to be used in the future to provide regulatory relief to operators during pandemics for medical, training, and currency/proficiency standards. In the current system, the FAA can provide regulatory relief under 14 CFR part 11 if a public request is received. The study will also analyze various legislative systems and how they contribute to or hinder national civil aviation authorities in responding to emergency situations. Lastly, the study will identify impacts to safety and incorporate safety measures into a risk mitigation plan. All results will be shared with the FAA and ICAO for pandemic contingency planning.

- Covid-19 Justification: Develop protocol for regulatory standards during pandemics.
- Research Team: Caroline Ocasio, InterAmerican University and Dr. David Delaine, The Ohio State University

24) BLI/Program: FAA Policy, International Affairs, and Environment

Project: Remote Training Solutions for FAA Regulatory and Administrative Tasks during Pandemics

Funding Need: \$250,000

Description: The purpose of this study is to analyze best practices within ICAO from COVID-19 and identify remote training solutions for completing FAA regulatory and administrative tasks during future pandemics. Results of this study will include a recommendation report for the FAA. This will alleviate future challenges that impact effective operations.

- Covid-19 Justification: Provide remote training solutions for regulatory and administrative task during pandemics.
- Research Team: Caroline Ocasio, InterAmerican University and Dr. David Delaine, The Ohio State University