High-Fidelity Simulation and Training to Improve Coordination Between Aerospace Specializations

Paul A. Craig
Richard G. Moffett
Glenn E. Littlepage
Michael B. Hein
Andrea M. Georgiou

See next page for additional authors

Follow this and additional works at: https://corescholar.libraries.wright.edu/isap_2011

Part of the Other Psychiatry and Psychology Commons

Repository Citation

This Article is brought to you for free and open access by the International Symposium on Aviation Psychology at CORE Scholar. It has been accepted for inclusion in International Symposium on Aviation Psychology - 2011 by an authorized administrator of CORE Scholar. For more information, please contact library-corescholar@wright.edu.
Authors

This article is available at CORE Scholar: https://corescholar.libraries.wright.edu/isap_2011/16
This Symposium contains the first reports of research being conducted at Middle Tennessee State University using a scenario-based teaching methodology with students across multiple disciplines of aviation training. The MTSU Center for Research on Aviation Training is a NASA funded project that had built a replica of an airline’s flight operations center. The basic research of the project involves the interactions between aviation professionals. These interactions can produce smooth and safe operations for passengers, profits for employers and economic benefits for the national and the world—or these interactions can yield chaos, frustration and loss of revenue. This research brings together pilots, flight dispatchers, controllers, maintenance technicians, weather forecasters and managers into one simulation. The research aims to learn the “best practices” for using this real-world scenario teaching method and to send graduates into the workforce better prepared for the interactions that they will face.

Today, students are trained in various disciplines of aviation in isolated clusters. The pilots train with pilots, the maintenance technicians with other technicians, dispatchers with dispatchers, controllers with controllers, and so forth. Prospective employees are coming to the job market through independent “silos” of training, but this training does not always reflect the way operations run in the real world. Once students enter the job market, they realize that success and efficiency depend on cross-disciplinary communications and understanding. By dismantling the silos, we want to prepare the next generation of aviation professionals in a real-world environment and enable employees to perform better on the job from the first day of hire.

Imagine a situation where students from all aviation and certain business disciplines come together in a laboratory. Instead of attending a typical classroom lecture, they are immersed in a practical, hands-on experience as they “work a shift.” They enter a room with a bank of screens on each wall. The screens project real-time weather, aircraft tracking maps, aircraft status boards, crew schedules, aircraft parts inventories and any other information required to run an airline for that shift. This is an airline’s Flight Operations Center—sometimes called the “war room.” Located in the Business & Aerospace Building, MTSU Aerospace has a replica of such an Operations Center that allows students the opportunity to learn in a real-world scenario based environment. The students’ shift in the Center might begin with incoming flights that have maintenance issues. Pilots in the scenario would have to troubleshoot the problem while in flight and communicate to flight dispatch and maintenance technicians the nature of the problems. When the airplane lands, the technicians would go to work on the problem and soon a decision would have to be made about that airplane’s availability. Can the problem be repaired before it is time for the airplane to be loaded and dispatched on its next flight, or will another airplane be required? Do we even have another airplane that can do the job? When it was time for the push of departing aircraft to begin, the action would shift to an air traffic control ramp/tower simulation. The simulation reproduces the size and layout of a ramp tower with “out the window” visual systems, allowing students to look out of a virtual window onto the flight line. Ramp/Ground controllers orchestrate the entire departure sequence from push back to takeoff. At the time of departure, a scenario could be presented of deteriorating weather. Thunderstorms in Nashville might delay departures, and fog in Florida would delay arrivals—all of this must be worked out using a total employee scenario-based approach. Solutions to the problems proposed by one group might create even more difficult problems for others. To avoid complicating the problem, students would have to learn the other group’s concerns and issues—just like in the real world.
In creating the Center for Research on Aviation Training, the Aerospace Program at MTSU is testing a new method for preparing students to work in the aviation industry. We are not aware of any other university or training center that is using this approach. The center itself goes by the name Flight Operations Center – Unified Simulation or FOCUS. The FOCUS lab consists of three work areas: the ramp tower, the aircraft flight deck and the operations center. The operations center has separate workstations for the Flight Operations Coordinator, a Flight Data position, Maintenance Control, Maintenance Scheduling, Crew Scheduling and a weather station. These workstations are strategically located within the center to facilitate cross communications.

Several subcontractors supply the hardware and software to make the virtual airline operation. The Computer Sciences Corporation (CSC) is the contractor for the ramp tower and radar displays. Talon Systems is the provider of crew, aircraft and maintenance scheduling software. Next year Frasca International will be the contractor for a CRJ 200 Regional Jet simulator which will represent one airliner in the fleet. The virtual airline is named Universal E-Lines and operates to fourteen cities in the Southeastern United States with hubs in Nashville, Tennessee and Jacksonville, Florida.

In the early 2000’s, the MTSU Aerospace Department became a research leader in the area of Scenario Based Training for pilots. The Federal Aviation Administration has cited this research in the Federal Register as the seminal work that has changed the way pilots are being trained today. Much of that early research centered on an individual’s situational awareness (SA) and the high quality decisions made because of that awareness. This new research takes the gains made with pilots in scenario training and broadens the reach to all aviation functions. Again the primary focus is on situational awareness, but now it is about Group Situational Awareness (GSA) or “shared mental models.” The research will produce a series of “best practices” for real-world aviation training and should produce students who are better prepared for the work force.

Someday, a businessperson or vacationer will make a connection from one airplane to another without any problems or cares. The arriving and departing flights will be on time. The aircraft will have all its maintenance performed and will be completely safe. The flight crews will be well rested and alert. The airline will earn a profit. Even the baggage will make the correct connection. The system will work well that day because employees of that airline made competent and informed decisions that allowed the system to work smoothly - Decisions they first learned to make at MTSU’s Center for Research on Aviation Training.

The Symposium

The work of the NASA FOCUS lab is a multi-year project, 2010-2011 being the first academic year. Additional opportunities for data collection, observations and curriculum development are still to come, but this symposia presents the first deliverables from the project.
The first presentation, delivered by Dr. Paul A. Craig, describes the development and use of the simulation lab. It involves how the NASA FOCUS lab accomplishes the simultaneous operation of multiple flights from multiple airports and the various professional specializations required to operate the virtual airline and deal with unplanned situations.

The second presentation, by Dr. Mike Hein details the affects that stereotypes play with regard to effective interaction among aviation professionals. Psychology professors will present Using a Measure of Occupational Stereotype to Assess Ingroup-Outgroup Bias among Aerospace Specializations.

Ms. Andrea Georgiou presents the third paper on the Development of Criterion Measures to Assess Interpositional Knowledge and Task Mental Models.

The fourth presentation, lead by Ms. Jennifer Henslee is a report of research on Multi-team Coordination within the simulated airline operation. The research focuses on Interpositional Knowledge and Task Mental Models.

The final presentation by Mr. Gerald Hill discusses the application of these concepts into the aerospace college curriculum. One goal of the overall research effort is to develop a list of “best practices” that would guide collegiate aviation away from the “silo-only” model and toward a more realistic student preparation model.