

Flight Operations Center – Unified Simulation

FOCUS

Middle Tennessee State University

Educating tomorrow's aviation professionals.

Keeping aviation's economic engine moving ahead.

The FOCUS Lab is a NASA funded research project which is designed to better prepare the next generation of aviation professionals. The Principal Investigator of the project is Dr. Paul Craig. Craig has been the PI on a total of four NASA grant projects since 2003. In the FOCUS Lab, he leads a team of a dozen Graduate and Undergraduate assistants from MTSU's Aerospace and Psychology Departments, and the TLSAMP program.

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 nationals and the world – or these interactions can yield chaos, frustration, and loss of revenue. This research is using a new teaching methodology to better prepare graduates to maximize the benefits of these interactions.

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.

One of the places where all aviation disciplines intersect would be in an airline's Flight Operation Center – sometimes called the “war room.” The MTSU Aerospace Department built a replica of such a Flight Operation Center – called the FOCUS Lab- and within that lab students operate a virtual airline – Universal e-Lines.



UNIVERSAL *e* LINES

Imagine a situation where students from all aviation 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. The shift in the FOCUS Lab might begin with incoming flights that have maintenance issues. A Frasca CRJ 200 FTD links to the FOCUS Lab. Pilots flying the FTD communicate via an ACARS frequency directly to the FOCUS Lab while employees in the lab watch the FTD fly their routes on video screens and radar maps. Pilots in the scenario troubleshoot problems 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 prepared for 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 the Ramp Tower simulation. The simulation produces an “out the window” visual system of the Nashville International Airport, allowing students to look out 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 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 a contributor for the 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. The FOCUS Lab 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 is producing a series of “best practices” for real-world aviation training and is producing 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 in the FOCUS Lab.

PARTNERS WANTED! In the grand overall plan, less and less of the Universal e-Lines’ flights will be “piloted” by the computer. One by one, we want to replace computer-flights with actual crews. The MTSU CRJ and FOCUS Lab are five miles apart, but connected via the internet that distance could easily be 500 miles or 5,000 miles. We want as many collegiate aviation program partners as possible to fly some of the Universal e-Lines’ routes in real time – each communicating back to the FOCUS Lab to produce a virtual airline world with unlimited

lines of communications – just like the real world. We believe that by widening the scenarios, even more students will be better prepared for day-one of their aviation careers.