

Advanced Simulation Training for Air Traffic Control – Transformational Results

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By definition, according to Wikipedia.org, simulation means to imitate; pretended behavior to make an impression; or creation meant to communicate or appeal to sense or mind. Simulation is used in various trades for training purposes. In the world of aviation, the development and use of simulators has evolved and transformed the industry.

The History of Aviation Simulation

One of the earliest true synthetic aviation (flight) simulators was designed and built in 1910 and consisted of two half sections of a wood barrel mounted on a frame and

moved manually to represent the pitch and roll of an airplane.

The need for the training of large numbers of pilots during WWI encouraged the development of devices to be used to aid in the assessment of the aptitude of potential airmen. In 1915, a machine was proposed and used for measuring pilot reaction time and correcting disturbances. This simulator consisted of a rocking fuselage fitted with controls and an electrical recording apparatus.

During WWII, electronic flight simulation was developed, lending way to the creation of the instrument

flight simulator. After the war, full motion simulators versus ground based simulators were developed. Analog computerized simulators were created and Pan American Airways installed the first full aircraft simulator in 1948. The 1960s brought about the digital computer era along with digital image systems for simulation.

Today, simulation companies like Adacel, a leading developer of advanced simulation and control systems for aviation and defense, have taken computer digital images to 3D and can spread across multiple LCD screens offering up to 360 degree panoramas.

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These simulators are driven by language technology which includes speech recognition and voice activation systems. These systems allow the user to speak directly to the computer and expect an audible response, just as if they were speaking to a live person.

Commercial Airline Simulation Training

Since the 1970s, the airline industry has relied upon simulation training for qualifying their pilots for employment, type ratings, and emergency procedures. Pilots are able to train to a higher level of competence than is possible in an actual aircraft. Not only do pilots qualify to fly a particular aircraft prior to taking the controls of a plane loaded with passengers; flight crews (pilots and flight attendants) are trained in full aircraft simulators to work as an effective team.

Rare but critical and time pressured events can be recreated so protocols can be established and communication problems can be identified in a safe environment. The extensive use of simulators in the airlines has proven that practice inherent in simulations enhances transfer of knowledge to on-the-job performance.

Advanced ATC Simulation Training: 2008 to Present Day and the Future

Adacel is a top supplier of air traffic control simulators. Advanced ATC, Inc. (AATC) selected Adacel's MaxSim, (affectionately called the "stimulator" by the supplier) as the nucleus of their training program. AATC's MaxSim offers a 315 degree panoramic view of seven different airports: the FAA Academy, Valdosta, San Antonio, Dallas-Ft. Worth, Dulles, Atlanta, and Washington National; voice recognition capability; and complete console with STARS, ETVS, and FDIO.

The MaxSim ATC simulator enables efforts to safely optimize controller training and reduce dependency on operational on-the-job training. It maximizes TTC (Time to Certification) and allows

students to venture into high risk scenarios without compromising safety.

AATC, a privately held company located in Valdosta, Georgia, in partnership with Wiregrass Georgia Technical College, offers an accelerated Control Tower Operator's Certification program, commonly referred to as a "CTO School." The firm's executive team consists of three retired air traffic control managers with over 100 years total combined Air Traffic Control (ATC) management experience. Recognizing the need for highly qualified professional controllers, it was the common mission of the executive team to find a highly effective, efficient training solution.

In developing AATC training, the team researched reports, studies, and testimonies before congressional committees with regard to ATC training. One report issued by the MITRE Corporation Center for Advanced Aviation System Development (CAASD), captured the attention of the team and bore relevance on their decision-making process for selecting the right simulator for training.

The MITRE report suggests that advanced training techniques such as scenario-based instruction, voice recognition and synthesis (VRS), and Intelligent Tutoring Systems (ITS) reduce the time and costs required to attain Certified Professional Controller (CPC) status. Therefore, having learned from the airline industry the successful use of simulation training, combined with information and recommendations by the MITRE report, AATC designed a program which places heavy emphasis on simulation training rather than on-the-job training (OJT).

Qualification Process

In order for an applicant to qualify for the program, he/she is required to schedule a tour of the facilities which includes an interview, medical screening, and a

security background check. AATC uses its simulator to qualify a prospective student into the ATC training program. It is vitally important to determine the desire and skill-sets of a potential student to ensure a 100 percent success rate.

Using the simulator as a screening tool has allowed AATC to evaluate the aptitude and/or cognitive thinking of a potential candidate for training. The key evaluation factor however, is referred to as the RCE (Roller Coaster Effect). This effect is the body language displayed before, during, and after the applicant works in a simulated ATC setting.

The same can be seen when someone rides a roller coaster. As the roller coaster ride finishes, you can see a variety of facial expressions indicating excitement, apprehension, fear, joy, and happiness. One out of ten applicants will display some type of apprehension or fear after working in the simulator. They usually will self eliminate, having had a bad experience in the simulator. The other nine will usually have a smile from ear to ear and say something like "that is so cool."

Many applicants schedule another tour just to experience the simulator a second time. This also gives the prospective student the opportunity to "try" the job out in a safe environment and to see how they feel about the job. After successfully completing this evaluation process and interviewing with an executive team member, a candidate can apply to enroll.

Transformational ATC Simulation Training

Simulation instruction is introduced early in AATC's Control Tower Operator's program with a sprinkling of hours, but then rapidly increases to hundreds of hours involving site-specific orientation, teamwork, procedures and coordination, strip-marking, phraseology, flight data, clearance delivery, ground control, emergency procedures and assistance, and local control.

AATC students gain an edge in the industry by working complex runway

configurations and high intensity traffic problems in the simulator. AATC students learn to deal with high pressure situations including simultaneous arrivals and departures on parallel runways and intersecting runways along with wake turbulence in all kinds of weather conditions where quick decision making and separation rules come into play.

Students train in the simulator for six months or more and will exceed 400 hours of training during that time. Scenario development is vital to meeting the task requirements and objectives to ensure skill mastery. In the first four months of simulator training, the focused objective of “Priority of Duties” is emphasized in each scenario.

At the four-month mark, special emphasis is placed on “Anticipated Separation.” This is the time when students are taught “Precision Timing” (PT), particularly in heavy departure scenarios. To be effective, the student must have a rhythmic mode of radio transmissions while simultaneously using the minimum runway departure separation.

Complexity is later added to challenge the student with additional operations on other runways. A master scenario problem is used for an “operational assessment” in the mastery of skills. To date, all graduates have been able to successfully work an ATC 12-level problem.

The REST Rule

Advanced ATC applies what is called the REST (Recommended Effective Simulator Training) rule. This means that 90 percent of advanced training is conducted in the simulator, and 10 percent is OJT. This concept is nothing new to the airlines in performing flight training and proficiency evaluations.

Use of *high fidelity* simulation with voice recognition (VR) is fairly new at the facility level in the FAA. Traditional mindset is to give a minimal amount of simulation to a developmental so they can begin OJT as soon as possible.

The REST rule will have the best results for ATC facilities that do not have constant traffic existing for training

purposes. Depending on the ATC facility using simulation, a developmental could be trained up to a 300 percent traffic level. For example, if the average hourly traffic count is twenty operations, it is very conceivable for the developmental to be able to work up to sixty operations per hour. Using this concept, Time to Certification (TTC) could be reduced up to 75 percent.

Additionally, a new concept to accept is that a developmental can be trained to a 90 percent level and have never set foot in the assigned facility. Also, the developmental does not have to be totally trained on the footprint of the facility in which they will eventually work. Effectually, a total mastery of ATC skills could be demonstrated on a multitude of runways and/or airport configurations.

When this happens, only a small amount of facility-directed training would need to take place. When a developmental achieves a 90 percent skill-set in the simulator, a supervisor from the gaining facility comes to the training location and conducts an operational assessment graduating them to the facility level of OJT training. This concept reduces the workload at the facility level allowing them to optimize staffing resources.

Benefits of Simulation Training:

- Accelerates knowledge transfer through learning by doing in an operational error-free environment.
- Provides the developmental with realistic and relevant contexts in which to assess and develop understanding, knowledge, and skills.
- Practice in simulations enhances transfer of knowledge to on-the-job performance.
- Enables the developmental to demonstrate knowledge by applying new skills.
- Provides real-time feedback allowing the developmental and instructors to assess their current situation.
- Interactive, dynamic, engaging, and fun.

- Time to Certification (TTC) significantly reduced.
- Long-term training can take place at a different location.
- Training costs are significantly reduced.
- Separation errors reduced while performing OJT.

Lessons Learned in ATC Simulation Training

- Do not underestimate the abilities of students to master a training scenario quickly.
- Be prepared to develop new scenarios on a daily basis.
- Just when you think a student has reached his/her highest skill level, they will prove you wrong.
- Students having trouble with a particular skill need to practice, practice, and more practice. Be patient; they will get it.
- Focus on the team concept. Students will pull together and help one another. Teamwork improves learning and improves confidence.
- Have high expectations – students can always achieve them.

Transformational Results

By implementing and developing advanced training techniques, technologies, and the REST approach, Advanced ATC has seen great success in the certification of Control Tower Operators. A student may enter their program with little or no previous ATC experience and in 52 weeks work high volumes of traffic with extreme complexities.

After two years of operation, AATC's executive team continues to witness this transformational result in their students. Currently, AATC has 15 graduates – all of whom have received their FAA CTO with a facility rating. Twenty more students are in various stages of training.

New classes begin monthly, with limited enrollment. For more information or to schedule a tour of AATC's training facilities, contact Admissions at 866-938-0398 or go www.advancedatc.com. ■