

## ATC Licensing Through Simulation

by Gary Pearson & Tom Evers

Licensing air traffic controllers without ever setting foot in the real tower or radar room...it will never happen. A self-fulfilling prophecy if that remains the prevailing attitude. Perhaps licensing using only simulation is too lofty a goal for now, but the fact is we could get a lot closer. All it takes is vision and the Jean-Luc Picards of the aviation world to say “make it so”.

Simulation has made considerable inroads to the long process of molding new controllers. It is generally accepted as an essential tool at the ATC schoolhouses of the world and has even bridged the gap into operational training. The reason is straight forward...it works and it works well.

Simulation is generally credited with increasing training system throughput and success rates. Moreover, it is becoming apparent that simulation helps produce better graduates who demonstrate experience beyond their years. It leads to reduced operational training periods; as much as 50 percent or more in some cases. Seemingly this is all good news for a system facing an air traffic controller shortage of tidal wave proportions.



Yet the line in the sand is still drawn well short of full qualification. On-the-job training despite its inherent inefficiencies is still the method relied on to determine if and when to unleash a fledgling controller. It is not uncommon for the OJT period to take longer than the rest of the training combined; all the while inflicting the ramifications of unqualified personnel on live

traffic. Delays cost money and all too often the finger is pointed at inexperienced trainees in the control seats. You would think that an operation bent on increasing system capacity would be eager to eliminate such an obvious bottleneck.

So, why doesn't simulation play a far greater role in ATC licensing? Some point out that using a traditional simulator takes too many people to support it, reducing its availability and making it too expensive to replace OJT. Speech driven systems exist that eliminate this problem, but still there are those who believe that the fidelity of any simulator alternative just does not measure up to real standards. We have all heard the criticisms. The technology isn't there yet. Speech recognition isn't good enough; the supported phraseologies are too restrictive. The simulated pilots don't act like real pilots do; they just don't have the cognitive skills. Simulation can't mimic real world equipment and operations closely enough.

Undeniably some of the criticism of today's systems is still valid. It need not be. Technology has been a convenient scapegoat, but the reality is that technology has advanced to the point where sufficiently high fidelity systems are feasible. You want more phraseology; it's possible. You want stellar graphics; it's possible. You want better pilot behaviour; it's possible.



Easier said than done? Perhaps, but these statements are not made flippantly. While there are many facets to the fidelity issue, some challenging, some not; there is ample evidence to confirm that almost anything can be overcome.

Take for example speech recognition. It is more than a collection of words. The words must be processed to trigger the correct aural and behavioral responses, just as they do in the human mind. If the system doesn't know the meaning of the words, then it can hardly be expected to process it properly. The result is pretty much the same as when your doctor chooses to ramble on at you in medical jargon. The fact is that excellent systems already exist that can and do outperform humans in similar circumstances. Supported phraseology and the degree of flexibility for wording choices within that phraseology are simply a matter of defining the system's vocabulary.

It is entirely possible to substitute “stop left” for “cleared to land runway 2 8 left.” Whether or not that phraseology is acceptable for licensing standards is another matter.

What about pilot behaviour? Fair question, but again the solution is closer at hand than you might think, in the form of Intelligent Agents. This technology enables the modeling of pilot thought processes to inject life into the up until now “dumb” aircraft models within the simulation. Intelligent software agents differ from programs in two key areas, namely they can both adapt and learn from the simulation environment. Better use of intelligent agents could allow simulated pilots to ask for level changes due to turbulence or route changes due to thunderstorms. The intelligent agents may even question the controller if they consider the instructions given to be unsafe or more importantly if the communication was not fully understood. Furthermore, the technology allows for variations in the “intelligence levels” of each aircraft, so that the controller does not become used to speaking only to “super pilots” and has to deal with many proficiency levels as he would do in the real world. Intelligent Agents are already being used in a wide variety of roles. Only recently the technology was used to demonstrate a number of unmanned air vehicles operating in formation to execute a combat mission autonomous of human interaction.

If technology isn't the real problem, what is holding back the extended use of simulation in the ATC licensing process? The true issue is trust and commitment. Where would the aviation industry be today if the pilot community had not made the necessary commitment to stimulate flight simulation? The common thread here is that industry can do what you want it to do, but industry can't set the boundaries. Granted industry must do a better job in communicating just what is possible in ATC simulation fidelity, but the ATC community must set the limits for acceptable standards and demand better simulation capabilities accordingly. This will set the course for simulator development. For example, the United States Air Force did exactly that when in 2001 they demanded a tower simulation capability that would use speech recognition as the sole means of controller input. In fact by insisting that there would be no human pseudo pilot fall back capability they were clear that nothing less than a working speech recognition solution would be acceptable. With this vision, the USAF has successfully deployed 88 tower simulators and has reportedly achieved reductions of between 30 and 50 percent in operational training times.

When new air traffic controllers walk onto their new job at their new facility for the first time they should have an overwhelming feeling of deja-vu. Simulation can do this and more...if we let it. If it is not good enough now, it isn't because it can't be done, it's because the system doesn't believe it can be done. The aviation community in general and the ATC powers in particular need to provide the impetus to generate growth. Perhaps not on the same scale as flight simulation, but certainly with the same vigor.

Worldwide ATC is facing a crisis in air traffic control training. There is a need to license more controllers in less time without degrading standards. It is naive to believe that this can ever be accomplished clinging to age old methods. OJT is clearly inefficient. Simulation holds the promise of a better way. Unfortunately that better way will not materialize in time without the will to get it done.

Industry certainly cannot go it alone. Already many players have bowed out because there is insufficient resolve to lead the way. If the major ATC organizations of the world truly want to resolve their training issues, then they need to believe that it is possible and insist that it happens.

In the end it sort of reminds you of a long journey with the kids complaining in the back seat; “When are we going to be there?” We may get there eventually, but the fact is its going to take a lot longer if we don’t soon take a look at the map and put some gas in the car!

