Distance Education in the Business Aviation Industry:
Issues and Opportunities

Mahesh S. Raisinghani, University of Dallas, USA
Mohammed Chowdhury, University of Dallas, USA
Chris Colquitt, University of Dallas, USA
Pedro M. Reyes, University of Dallas, USA
Nilofar Bonakdar, University of Dallas, USA
Joseph Ray, University of Dallas, USA
Jose Robles, University of Dallas, USA

ABSTRACT

The purpose of this research is to understand the expectations and behaviors of business aviation pilots toward online learning. The authors believe that the company able to offer an integrated, individualized and useful online training experience will gain a significant competitive advantage. To that end, the authors have researched and synthesized studies that are currently available and relate to this important future product. In addition, an exploratory survey of business aviation pilots and interviews with key aviation industry players are used to determine current attitudes and expectations toward online learning. The scope of this paper will be limited to exploring the niche market of business aviation pilots using the aviation training company CAE SimuFlite and their new Simfinity™ technology. However, the authors consider the concepts discussed to be applicable to all business aviation pilots.

Keywords: *active learning; business aviation industry; decomposed theory of planned behavior; visual imagery effective communication*

INTRODUCTION: BUSINESS AVIATION INDUSTRY

The business aviation industry is a niche market within the general aviation industry concerned with air travel services specific for business customers. This industry ranges from individuals owning one small piston-powered aircraft to multinational corporations that possess a number of larger long-range jet aircraft that can carry up to 19 passengers over several thousand miles. The majority of business aviation missions are conducted on demand. Only a handful of companies operate scheduled flights, and are typically known as "corporate shuttles."

According to the National Business Aviation Association (NBAA), the number of companies operating business aircraft increased nearly 50% between 1999 and 2001. This is largely due to the corporate world's realization that the use of business aircraft as a means of transportation and a viable business tool leads to increases in efficiency and productivity (NBAA Business Aviation Fact Book, 2002). The worldwide fleet size for business aviation exceeds 22,000 aircraft, with the vast majority of business aircraft (more than 15,000) located in the United States (U.S.). Moreover, in a recent survey by Honeywell Aerospace Company, the expected number of business jet deliveries worldwide over the next decade will exceed 8,400 aircrafts, valued at more than $130 billion. Each aircraft that is scheduled for full-time operations would typically require five pilots per aircraft — more than 100,000 business pilots required worldwide (with more than 75,000 for the U.S. alone). This means that over the next 10 years, more than 40,000 new pilot positions will be created due to the arrival of new aircrafts alone.

STATE OF BUSINESS AVIATION TRAINING

Business aviation pilots are highly trained and usually possess advanced pilot credentials, such as an Airline Transport Rating (ATP). In the U.S., business aircraft fly under strict regulations as defined by the Federal Aviation Regulations (FAR) of the Federal Aviation Administration (FAA). The training required under the FAA and similar regulatory bodies worldwide is very specific, where a pilot in command (captain) requires continuous training every 6 months and a second in command (co-pilot) will require training at least once a year. The training is aircraft specific and is requisite for each aircraft the pilot flies.

At a meta-level, the key difference between existing online education systems and those for aviation pilot training relates to the online education that is envisioned for successful pilot training. The intent of this study is to empirically explore the relevant concepts and ideas based on perceptions and previous studies of pilots coupled with what is envisioned for the future of online distance learning (i.e., data centric, artificial intelligence, simulation and interactive multi media). Today, this training is almost always conducted in a combination of personnel study, classroom lectures and simulator training. One major facility that conducts this type of training is CAE SimuFlite in Dallas, Texas. SimuFlite opened in 1984 as the first of its kind to offer multi-platform training in a comfortable environment at one location. That same year, the first all-simulator business jet type rating was earned. Simulator training is the standard for today's pilot to earn aircraft type ratings because it is more cost effective and safer than using actual aircraft.

In the latter part of the 1980s, SimuFlite introduced a computer-based training (CBT) program called FasTrak. It was tedious and non-engaging. Pilot customers were dissatisfied; therefore, FasTrack was eliminated in 1991. Unfortunately, this failure damaged the reputation of SimuFlite and followed them for many years. Today, SimuFlite has more than 375 employees and 29 full-flight motion simulators. It has revenues of C$150 million and is owned by CAE of Canada. CAE is a conglomerate dedicated to aerospace, defense and marine control technologies and training solutions. Based out of Canada, CAE generates revenues in excess of Canadian $1 billion and employs more than 7,000 people (CAE SimuFlite, n.d.).

PRODUCT DIFFERENTIATION

CAE SimuFlite is the No. 2 provider of business aviation training, following Flight Safety International (FSI). Additionally, there are a number of smaller training facilities that exist throughout the world. Growing competition due to increased market demands and substitute product offerings created by new technologies are threatening SimuFlite's market share. To remain competitive and to continue to be a leader in business aviation flight training, SimuFlite is in an opportune position to combine the well-established training knowledge and techniques with the cutting-edge technology of CAE in order to provide interactive distance learning.

SimuFlite's business strategy can be viewed as customer centric. By understanding its client (the business aviator) as well as catering to the capricious and quality-demanding nature of this niche market, a well-thought-out online ground school training program will not only cater to the new demands of the future computer-oriented business aviator but also to the cost-conscious aircraft operator who wishes to reduce the pilots' time away for training. With the addition of other technologies and techniques, such as "virtual instructors," customer relationship management (CRM) tools, differentiated instruction theories and broadband Internet, we could avoid a repeat of the FasTrak failure. Today's technology can provide for well-planned and -executed differentiated data-driven instruction.

LITERATURE REVIEW AND SYNTHESIS

Pilots are by their education and vocation technically proficient. The pilot culture is one that enjoys new and exciting technology and is very inquisitive and diligent. Pilots enjoy change and newness, but they want to be in control (Rose, 2001).

Current Attitudes

Current attitudes toward distance learning and/or CBT for business aviation pilots are reflected in the concerns over the failed history of SimuFlite's FasTrack CBT training system. Clients were unhappy because they wanted more human interaction than was possible with FasTrack (CAE, 2003). Further, many other online courses are not delivered in a way that is conducive to effective learning (Sand & Schoenfelder, 1998).

According to Lehrer, Moore and Telfer's (1999) research, traditional pilot ground training that instructors conduct in the classroom environment is more on a surface or rote level instead of the deep or intrinsic level they found was desired by pilots. Many instructors take the approach of preparing the student to pass an exam by "teaching to the exam." One form of "teaching to the exam" is by using government aviation exam questions as talking points during class discussions and evaluations. They believe that there is a lack of congruence in how pilots and instructors approach learning, which can be overcome with the concept of *"Structure of the Learning Outcome"* (SOLO), first offered by Biggs and Collis in 1982. This five-level scaffolding approach can be combined with cooperative and collaborative learning and modeling to provide the deep or intrinsic learning desired by pilots. This scaffolding begins with the pre-structural level, where there is little understanding, and moves through five levels to the extended abstract level, where the pilot turns reflexively on oneself.

According to Small, Lakowske, Breese and Callejo (1999), CBT is limited by the lack of full user interaction required to fully explore complex tasks that call for "what if" analysis. They support a *"closed loop"* system of training — feedback provided using flight operations quality assurance (FOQA) programs and visualization systems — instead of the *"open loop"* system — infrequent feedback and little objective data to assess — used commonly today in pilot training.

A groundbreaking 1999 study by the FAA on the use of personal computer-based aviation training devices took the position that CBT training coupled with emerging technologies will be very beneficial in reducing the pilot error accident rate from its staggering 87% level in 1999. The FAA also allowed for the substitution of CBT hours for actual flight hours, a major cost savings for pilots and an official incentive for developing such systems.

A Forrester survey of training managers and knowledge officers of 40 global 2,500 companies conducted by John P. Dalton reveals that general attitudes concerning online training reflect enthusiasm about online training possibilities. Cost savings similar to the $80 million in travel and housing expenses saved by IBM as a result of their global online learning efforts in 1999 (Delio, 2000) could also be realized by the business aviation industry.

Differentiated Training

Herold, Davis, Fedor and Parsons (2001) provide excellent concepts in profiling the pilot customer around three important personality dispositions found to be directly related to training effectiveness; conscientiousness, emotional stability and openness to experience. Combined with the Aviation Education Reinforcement Option (AERO), concepts mentioned in the 2000 study by Karp, McCurry, Turney and Harms; and the Holistic Technology — Based Training models (HTBT) set forth in the 1998 study by Hsu and White, it is clear that any interactive training program must begin with understanding the training pilot.

HTBT is a *"virtual learning environment*" in which a thorough understanding of factors such as education and reading level, subject matter expertise, learning capabilities and experience of the student are essential. The pilots' training needs are then tailored and fitted into a *"collaborative learning environment."* In fact the HTBT models claim that the lack of collaboration is the *"Achilles Heel"* of technology-based training.

The AERO and SOLO models mentioned earlier both emphasize collaborative and cooperative learning. In the AERO model, collaborative learning is described as a team effort in which students are required to define "roles and responsibilities" amongst themselves. The AERO model combines collaborative learning with cooperative learning techniques, in which small groups of students engage to solve a problem.

"The AERO model incorporates elements of the adult education paradigm; learning style theory, including gender specific differences; cooperative and collaborative learning techniques; and personal computer-based flight simulator programs, to bridge the gap between the classroom and the flight line." (Karp et al., 2000)

Learning style theories must incorporate auditory, visual and tactile learners. However, in a combined study of 117 pilots by Karp, Condit and Nullmeyer (1999), the following results showed a definite majority of pilots, 44.4%, are tactile learners. Yet, the typical classroom setting for pilot training is geared toward the auditory and visual learner, with little support for tactile learning (Karp et al., 2000).

There are four key requirements necessary for an effective distance learning program: Interactivity, Active Learning, Visual Imagery and Effective Communication (Sherry, 1996). The technology currently exists for an online pilot training program to provide all of these requirements, and advances in technology and communications infrastructures will only improve those capabilities.

Online courses are already very interactive, with chat rooms, e-mail and threaded discussion groups. Many university programs offer highly interactive online courses, and the theories surrounding these techniques continue to evolve. Additionally, instant messaging provides a great medium for impromptu communications between a student and teacher or fellow student.

Active learning is the idea that a student should actually participate in the learning process, rather than simply listening to a lecture or reading a book. Certain aspects of the flight management system are available in a simulated manner, and delivering a virtual aircraft terminal to a student is certainly possible. Broadband promises to enable high-quality streaming video on demand. It is currently possible to deliver television-quality video on demand; as technology improves, the capability to send DVD- and even HDTV-quality video will be realized. This will enable pilots to view videos of cockpit scenarios or other training materials when they are best able to absorb that information. Effective communication is much less a technology issue as it is a responsibility of the training company. Students must be able to communicate with an instructor through one of the mechanisms mentioned above, and have their questions answered in a timely manner.

Hardware and Software Requirements

Increasingly complex technology and more demanding international airspace structures will challenge pilots of today and of the future. It is fortunate that the technology for training is also improving rapidly. The emergence of broadband Internet access has enabled most corporations and many individuals to overcome two of the fundamental limitations of the Internet: dialing in to an ISP and paying by the minute for access. Today, broadband carriers such as AT&T Broadband (www.attbi.com) offer high-speed, always-on access to the Internet at a reasonable, flat monthly rate. As broadband emerges as a common access method for people connecting to the Internet, the opportunity arises to provide a much richer online experience than has been offered before. With high-speed broadband connections it is possible to deliver video and audio on demand, as well as conduct live video conversations. In addition, with the always-on feature of broadband, it is possible to know when people are at the computer and contact them immediately in real time.

What this means for distance learning is that the opportunity to offer rich online content is very real; as broadband becomes more pervasive, the demand for these services will only increase (Butters, 1999). In the context of business aviation pilot training, the possibility exists to create a virtual flight crew, all online but at different physical locations, and present them with scenarios and observe how they react. Additionally, the ability to meet with and discuss issues with a professor via videoconference is already well within reach.

Differentiated learning models using modern educational concepts coupled with this improved technology will be essential. However, Sand and Schoenfelder (1998) remind us that the key driver for the adoption of new technologies should be their instructional value and not their capabilities. Maintaining focus on the instructional value of any new technology ensures that the training, in and of itself, delivers on its main goal of correcting a performance problem.

The technology suite required for the proposed model will have to address the needs for collaborative learning, cooperative learning and learning style theory as discussed in the SOLO, AERO, IDRS and HTBT models previously mentioned. It must be able to profile the pilot and to manipulate the learning style to provide the optimum array of audio, visual and tactile training that best matches the pilot's personality and learning style. Open standards such as XML will be important. Many collaboration tools are currently available. One example, *LearningSpace*™ software, provides for live, instructor-led training that combines application sharing, whiteboards, chat, audio and video. It is compliant with the Aviation Industry Computer-Based Training Committee Standards (AICC) and claims to be easy to use (Stokes, 2000). However, its compatibility with XML and other open standards is currently weak. Tools such as TraxMedia's *ToolBook II*™ software are excellent tools for providing Web-enabled true/false, multiple choice, drag and drop, and match item lesson capability (Selvaratnam, 2002). Simulation tools such as *Simfinity*™, provide for reengineered application simulation. In other words, they use actual software code used to create the original application in the simulation (actual flight data). This is enormously advantageous to CBT models in that the pilots are able to train with the actual configuration of their respective aircraft and experience real aircraft performance (CAE, 2002). The CAE tool suite, *seLearning*™, is currently being developed, but it is envisioned that it will provide an improved simulation environment with increased interactive content (CAE SimuFlite, n.d.).

Security Issues

Cyber-terrorism can be defined as the deliberate attempt to use the Internet to disrupt, cripple and/or cause havoc to an industry or business. Several different forms of cyber-terrorism prevail within our current environment, including computer hacking and the spreading of computer viruses.

While the Internet is a marvel in technological ingenuity, it does facilitate cyberterrorism and has become a breeding ground for both domestic and international terrorists. Terrorists have been increasingly using technology to further their cause, and some of the most sensitive sites in the world are vulnerable to this threat. For example, the U.S. Department of Defense (1999) has reported more than 250,000 attempts against its computer system in one year alone, 62% of them successful.

The boundary-less and ever-reaching infrastructure of the Internet provide terrorists with the incentive to be relentless in their attempts, knowing that their goal is within reach with minimal chances of being caught. Adding to this vulnerability and, in many cases, causing their own demise, are the security practices of many organizations. A recent study showed that while most organizations prepared documents outlining their Internet strategies, complete with benefits, costs and use, few of them had considered the security implications. Those that had took into account one or two specific areas of risk but remained vulnerable in others (Trapp, 1997).

Emerging Technology

We believe that rapid advancements in technology will enable "fully online, interactive, time and place independent" (Wentling et al., 2000) online pilot training in the near future. In addition to these technology changes, *"high quality e-learning products and services such as content providers, authoring tools, training management, portals, delivery systems and integrated solutions"* (Wentling et al., 2000), which are already available, will make distance learning for business aviation pilots more effective. One of the many advantages of online learning for pilots is that it "will bring together a heterogeneous group, with complementary and diverse skills. … Advances in e-learning technologies will continue to occur. These advances will be wireless, highly intelligent, interactive and integrative, accessible and easy to use. E-learning technologies will allow for a humanized learning environment. Online teams will be able to see and hear each other in real time on enlarged computer screens that will have high resolution" (Wentling et al., 2000).

By using video conferencing technology, pilots can learn from each other anywhere in the world. This technology will provide customized learning, so pilots can have their own personalized learning experience based on their preferences. Wireless connectivity is another issue that will make online training easier and more beneficial for pilots in order to learn anyplace, anywhere. This, coupled with the arrival of 3G, wireless broadband services and rich multimedia will give online training for pilots a new face in the future.

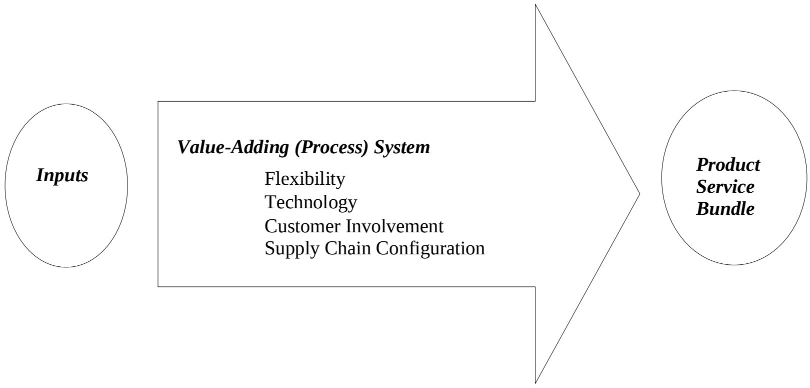
VALUE-ADDING (PROCESS) SYSTEM DESIGN

While online training for business aviation pilots' product service bundle is highly service intensive, it still follows the traditional transformation process. Figure 1 depicts the value-adding (process) system within the traditional transformation process. The value-adding (process) system design involves decisions about the system's flexibility, degree of customer involvement, technology and structure of supply chain configuration. These four factors, when taken together, create synergy with the potential to satisfy the customer. Flexibility refers to the system's ability to respond to changes in the learning environment and produce a wide variety of tailor-fitted outputs. Technology implies a wide variety of issues, such as computer science and information technology. However, technology in the value-adding (process) system design involves decisions about levels of automation. The degree of customer involvement relates to the customer's role in creating or customizing the product service bundle. Finally, the structure of supply chain configuration pertains to the structure of information flows.

The system's flexibility is one factor that creates a differentiated product for each customer. This is achieved through the interactive training program by adopting the student's prior knowledge base and tailor-fitting a collaborative learning environment in order to arrive at a desired output (e.g., highly trained business aviation pilot). This reduces the uncertainty in training needs and variability in the final product.

Online courses imply information technologies such as broadband Internet,

Figure 1. Value-adding (process) system within the traditional transformation process



largely due to the distance-learning concept. Yet in the design of the value-adding (process) system, technology here refers to the levels of flexible automation for interactive feedback from "virtual instructors." This may be found in customer relationship management tools, where the collaborative learning stems from segmenting the learning to a micro-level of one in an "anywhere-anytime" atmosphere.

The degree of customer involvement or "active learning" factor design should consider the customer's possible varying degrees of computer and information system literacy. Because the online course is not conducted in the traditional classroom setting, the customer fully participates in the learning process by interacting with the information. The supply chain configuration is structured by the information flows. The distance-learning concept allows for higher levels of spatial convenience by providing customers with access in a large number of places. This may include interactive chat-rooms, whiteboards and video-on-demand.

RESEARCH METHODOLOGY

This exploratory study is far from definitive, but it is expected to provide insight and guidance for others interested in this dynamic industry environment. Given the time and financial constraints, the scope of this study was limited to addressing only an online interactive training environment. Furthermore, since the organization that we focused on in study was CAE SimuFlite, the technological scope of this study was modeled on the tools *Simfinity*™ and s*eLearning*™ created by CAE (CAE, 2003) along with current and emerging technology. The integration of online training efforts with CRM and Enterprise Resource Planning (ERP) is outside the scope of this study. Perceived usefulness and perceived ease of use determine actual intentions and behavior (Davis, 1989). The Technology Acceptance Model (TAM) (Davis, 1989) is a popular theoretical model that could be used to adequately determine the behavior of an aviation pilot. However, online learning for business aviation pilots is currently not available; therefore, TAM could not be used to predict and explain the voluntary use of online learning for business aviation pilots.

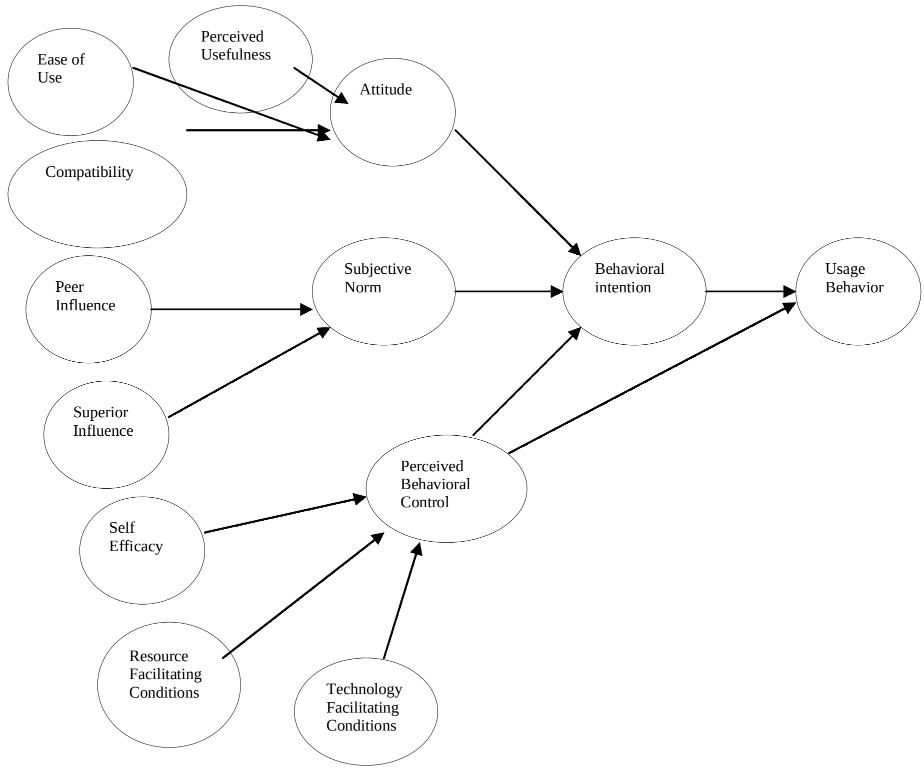
This study is based upon a simplified version of the Decomposed Theory of Planned Behavior (DTPB) to measure the attitudes and intention to use online learning for getting prepared for a check ride by business aviation pilots. The DTPB is an alternative version of the Theory of Planned Behavior (TPB) (Ajzen 1985, 1991), used to test the conditions where individuals do not have complete control over their behavior. The TPB states that behavior is a direct function of behavioral intention and perceived behavioral control. This model is depicted in Figure 2.

Since no viable online training system for business aviation pilots currently exist, the goal of this study is to suggest how to predict online learning behavior for business aviation pilots by gaining a through understanding of the intentions and attitudes of the respondents. In order to create a reliable data set, all the constructs used in the instrument were derived from the simplified version of the DTPB. The study used the seven major constructs in testing the DTPB: perceived usefulness, ease of use, compatibility, peer influence, superior influence, efficacy and technology facilitating conditions. The study could not use the construct of resource facilitating conditions because the uses of online learning for getting prepared for check ride by business aviation pilots were not available. Based on the literature review, a survey of pilots was appropriate to determine their openness to and expectations for online learning.

The survey for commercial pilots consisted of 20 carefully selected questions (Appendix A). The responses were given using a 7-point Likert scale, designed to be independent variables used to determine specific user perceptions and expectations of online learning. The intent of our survey, especially the first few questions, was to gain insight into the "attitudes" of pilots toward online learning. The major focus of the survey was to unveil realistic perceptions, expectations and attitudes of business aviation pilots toward the concept of online training. In the professional aviation world, the need for periodic training is routine and well defined, so the intent of any training program is clear. The function of any pilot training is to provide realistic scenarios and the relevant information on systems, procedures, rules, environment to handle the scenario (i.e., engine fire in bad weather on approach to Chicago's O'Hare International airport), so pilots can improve their "proficiency" and pass required check rides. In addition, pilots desire "intrinsic" knowledge. To maintain proficiency of piloting skills, business aviators are required to satisfactorily complete periodic FAA-approved ground schools covering related aircraft courses. They also must satisfactorily complete periodically scheduled flight and simulator checks according to FAA and company standards and procedures. For that reason, this study was concentrated on the aviation training market in Dallas, Texas — a major provider of business aviation training — among the business aviation pilots at SimuFlite in 2003.

Since there are business aviation pilots readily available at SimuFlite, a convenience sampling method was used to draw the sample from the Dallas/Fort Worth (DFW) area. Samples from 50 business aviation pilots were collected from area business locations: SimuFlite, Million Air of Addison and Piedmont of Love Field Airport, Dallas. Incomplete questionnaires were discarded and an additional sample was drawn. In order to provide anecdotal

Figure 2. Decomposed theory of planned behavior (Taylor & Todd, 2001)



evidence to support the study, interviews were conducted with key officials from CAE SimuFlite and with pilot clients.

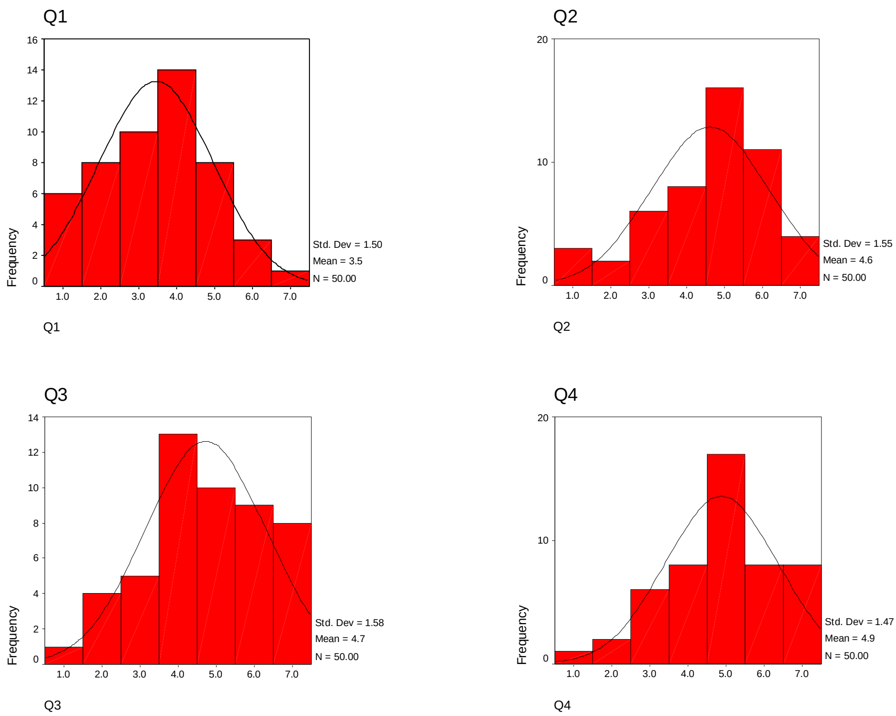
ANALYSIS OF FINDINGS

Following completion of the survey, the data was tabulated and entered into the Statistical Program for Social Sciences (SPSS) software for analysis. Descriptive statistics were collected for each survey question, and the constructs' independent variables (survey questions) were tested for reliability using *reliability analysis* to determine a Cronbach's Alpha (acceptable a > 0.70). The results were then used for a *factor analysis* using a *Varimax rotation*. A value of l > 0.40 was assumed to show strength of relationship between the independent variables (survey questions) and the dependent variables (constructs).

1. Perceived Usefulness

Forty-eight percent of the sample agreed that online learning will be beneficial for them to get prepared for a check ride, whereas 28% were neutral and 24% responded that it will be not be beneficial to take online training. It was found that 62% of the sample agreed that online learning improves their ability to get prepared for a check ride, whereas 16% were neutral and 22% did not agree. 54% of the sample agreed that the advantages of online learning outweigh the disadvantages,

Figure 3. Histograms for the perceived usefulness construct



whereas 26% were neutral and 20% were negative. However, Figure 3 illustrates that the response is strongly positive towards online learning being advantageous. Moreover, 66% of the sample agreed that overall, online learning presents advantages for them, whereas 16% were neutral and 18% thought it would not be advantageous for them.

Perceived Usefulness resulted in an unacceptable alpha of 0.6343. However, the study concludes that pilots are highly receptive to the possibility of online learning as a substitute for current traditional methods, but could quickly turn if the product does not provide interactivity, flexibility and useful knowledge.

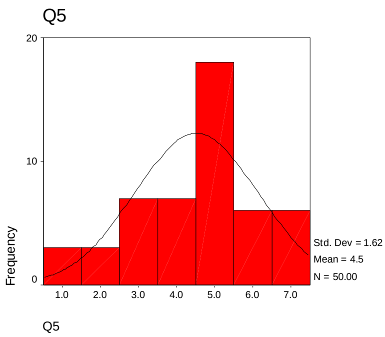
2. Compatibility

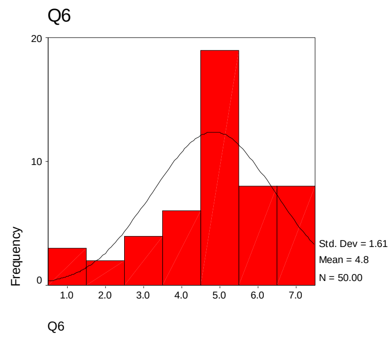
Sixty percent of the sample agreed that online learning fits well with the way they take ground training, whereas 14% were neutral and 26% thought it will not be compatible with the existing way they are taking the ground training. Subsequently, 70% of the sample agreed that online learning is compatible with their work style, whereas 12% were neutral and 18% think it will not fit with their existing work style.

3. Ease of Use

The study reveals that 58% of the sample responded that online learning would not be more difficult to follow than current

Figure 4. Histograms for the compatibility construct





training techniques, whereas 26% were neutral and 16% thought it would be difficult to follow. Forty-four percent of the sample responded that online learning would not require greater mental effort than the current training environments, 32% were neutral and 24% thought it would require a lot of mental effort. In addition, 36% of the sample responded that online learning was not frustrating, whereas 28% were neutral and 36% thought it is often frustrating. The authors assume that the response regarding frustration was made in comparison with the existing way they are taking ground training. During pilot interviews, a negative feedback towards online learning due to a perceived lack of interactive, audio, visual and tactical features was noted. Computer-based training, such as SimuFlite's FasTrack, has caused frustration and boredom for pilots in the past.

Sixty percent of the sample respondents expect online learning to be clear and easy to understand, 20% were neutral and 20% do not expect it to be clear and easily understandable. The positive response clearly indicates that the majority of respondents expect online learning to be user friendly and easy to operate. Neutral responses may indicate that they are not sure what it will be like, whereas negative feedback toward clarity and understandability of online learning may be due to their previous experience or lack of awareness of emerging online learning technologies.

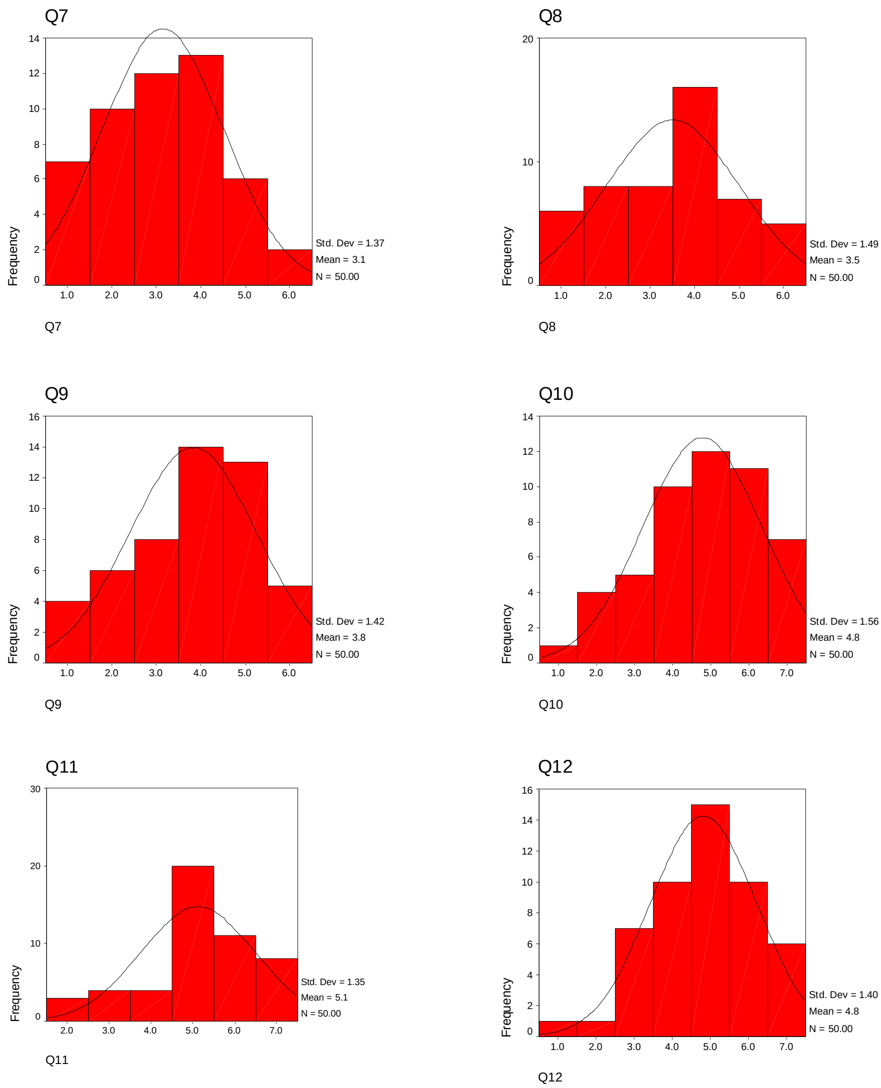
Subsequently, 78% of the sample respondents expect that online learning will be flexible to interact with, whereas only 8% were neutral and only 14% do not expect it be flexible. The positive response clearly indicates that almost 80% of the respondents expect online training to flexible and tailored to their needs. This shows a very strong desire for flexibility in any online learning environment.

Finally, the survey reveals that 62% of the sample respondent expects that online learning will increase their skill to get prepared for a check ride, whereas only 20% were neutral and only 18% do not expect it be flexible. The positive response clearly indicates that the majority of respondents expect online training will be able to help get them prepared for check ride at their own ease and convenience.

4. Peer Influence

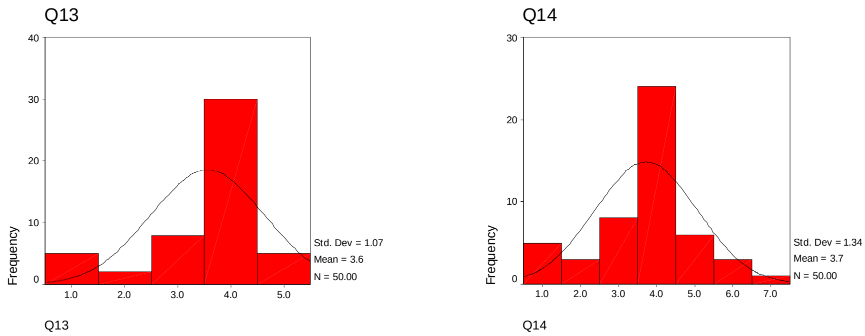
Thirty percent of the sample did not agree that their friends will have any influ-

Figure 5. Histograms for the ease of use construct



ence on them to take online learning to get prepared for a check ride, whereas 60% were neutral and only 10% believe that their friends can influence them to a certain extent. This negative response indicates that the respondents do not think that they will be influenced by their friends to take online learning. It was also observed that 32% of the sample did not agree that their fellow pilots will have any influence to take online learning to get prepared for check ride, whereas 48% were neutral and 20% believe that their co-pilots can influence them to a certain extent for online learning. The negative response clearly indicates that one-third of the respondents do not think that their fellow pilots will have any influence on taking online learning, whereas the

Figure 6. Histograms for the peer influence construct



majority of the respondents provided a neutral response, indicating that they are not sure whether their fellow pilots will have any influence on them.

5. Supervisor Influence

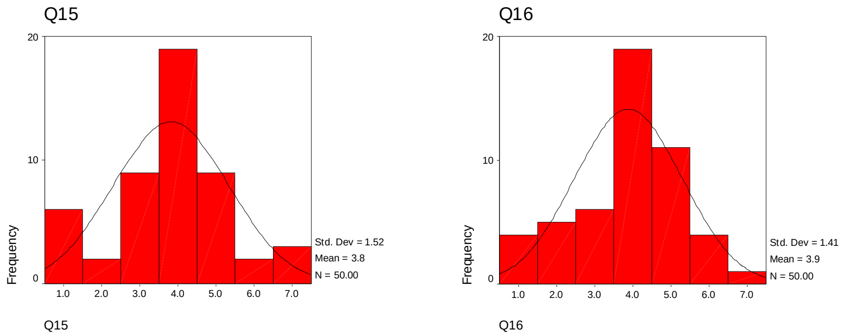
The survey reflects that Superior Influence was an important construct, and advise that more complete research be conducted in the future. Twenty-eight percent of the respondents agreed that their supervisor expects them to take online learning, whereas a 38% majority were neutral and 34% did not believe that their supervisor will expect them to take online learning. The positive response clearly indicates that 28% of the respondents assumes that their supervisor might expect that they should take online learning, whereas the majority of the respondents provide neutral response, indicating that they are not sure whether their supervisor will have any say regarding the interest for online learning, and one-third of them eliminated the possibility of superior influence for online learning.

Thirty percent of the sample did not agree that their supervisor will require online learning, 38% were neutral and 32% believe that their supervisor might require it in future. The positive response indicates that one-third of the respondents do think that in the future they will have no choice, since their supervisor will demand it; whereas a slight majority of the respondents provided a neutral response, indicating they are not sure whether their supervisor will need it in future. One-third of the respondents do not believe their supervisor will require it in the future. A survey of the owner operators may provide valuable insights and is suggested for future research. Figure 6 indicates that pilots think their supervisor will require online learning, but they are not quite certain.

6. Efficacy

Seventy-four percent of the sample agreed that they would feel comfortable using online learning, 14% were neutral and only 12% assumed that they would not feel comfortable using online learning. The respondents' average age was 43. We expected this generation of pilots to have much less confidence in using online learning. Since the great majority of respondents

Figure 7. Histograms for the supervisor influence construct



assumes that they would feel comfortable using online learning, we believe the niche market of business aviation pilots is more receptive for this product than previously believed. Sixty percent felt confident they could connect to online learning; 10% were neutral and 30% assumed that they would not feel confident. The confidence at being able to connect online indicates a high confidence and/or expectation of being able to use online learning anytime, anywhere.

7. Facilitating Conditions Resources

Forty-two percent of the sample did not agree that there would be computer resource constraints for online learning, whereas 38% were neutral and 20% believe there will be resource constraints. The negative response clearly indicates that the majority of respondents do not think they will face any resource constraint in using online courses. This may be interpreted as the pilots' belief and expectation that their existing personal and work computers are adequate for online learning.

Sixty-six percent of the sample did not agree that computer resources will be unavailable when they need to use them to take online learning, whereas 22% were neutral and only 12% believe there will be enough computer resources to get online

Figure 8. Histograms for the efficacy construct

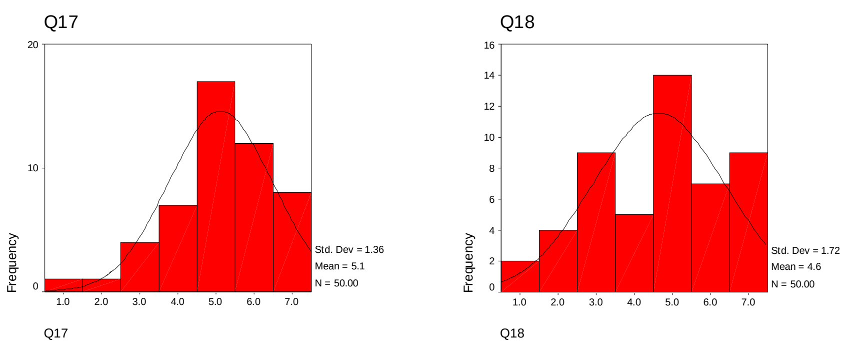
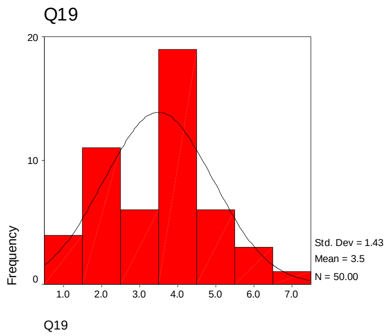
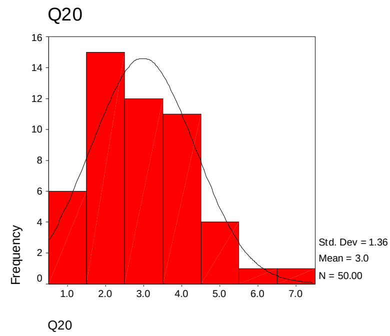


Figure 9. Histograms for the technology facilitating conditions construct





when they need. The response to this variable indicates a confidence and/or expectation for anytime, anywhere online learning.

CONCLUSION

This study explored the emerging opportunities and changing expectations contained in the vision of online learning for the business aviation pilot. It introduced and compared the concepts, perceptions and attitudes of online training for pilots and its relevance. The constructs Efficacy (EFF), Compatibility (COMP) and Perceived Usefulness (PU) are clearly seen as the top three determinants, respectively, of the pilots' perceptions of what quality online training will provide. The responses to Facilitating Conditions Resources (FCR) and Ease of Use (EU) constructs revealed a high degree of confidence in available resources and personal ability to perform online learning.

The number of new pilot jobs created in the next decade is conservatively expected to grow at more than 40%. In addition to planned growth, the need to replace aging business aviation pilots as they retire will also be significant. Training needs will therefore grow exponentially, as will the expectation by regulatory agencies and customers that future aviation training adopt the best of emerging technologies and techniques.

The attitude of today's business aviation pilot is changing rapidly. Two important factors that are pushing this change are (1) the different training needs required by modern glass-cockpit aircraft, and (2) the quickly changing awareness by the average pilot of new technologies, especially the Internet. Owners and operators of the business aviation industry will experience increasing financial pressure, as globalization and substitute products provide cheaper aircraft charters for the customer and cheaper training for pilots. To remain competitive and maintain leadership in business aviation flight training, SimuFlite has an opportune position to combine its well-established training knowledge and techniques with the cutting-edge technology of CAE to provide interactive distance learning.

Pilots' expectations of online learning are high, but not overly demanding of current and emerging technology. More importantly perhaps are the pilots' attitudes and beliefs brought out in the research, which clearly shows trends in the acceptance of and confidence in online learning. It is very important that the online training experience be highly interactive, with audio, visual and tactile features. It must also be very flexible, and easy to understand and use. Lessons should be modular and not only provide required training goals but also permit the pilot to explore deeper if desired. Real time and/or a virtual classroom environment were considered very important to commercial aviation pilots. The advantages of interactive online learning will be realized when broadband Internet, wireless protocol and pilot familiarity converge, and a critical mass of use and acceptance is achieved.

Initially, to grow to the level of online training described above, a business unit such as CAE SimuFlite can use current interactive technology such as Simfinity to offer lesson modules that also combine some audio, video and textual training simultaneously. Before implementation, however, pilot reactions must be tested. Pilot interviews show that pilots are highly receptive to online training but have a "show me" attitude. To introduce too limited a product likely will turn pilots away and make it more difficult to attract them in the future.

The business aviation industry is poised to undergo a fundamental change in the delivery of flight training to its pilots in order to accommodate cost and schedule pressures. The aviation training companies that intelligently embrace integrated distance learning to compliment flight training will be able not only to provide a more personalized and differentiated product, but also to survive the inevitable technology-driven changes.

REFERENCES

Azjen, I. (1985). From intentions to actions: A theory of planned behavior. In J. Kuhl & J. Beckmann (Eds.), *Action control: From cognition to behavior* (pp. 11-39). New York: Springer-Verlag.

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes, 50*, 179-211.

Biggs, J.B., & Collis, K.F. (1982). *Evaluating the quality of learning – The SOLO taxonomy*. New York: Academic Press.

Butters, G. (1999, Dec). Learning at lightspeed. *Business 2.0*. Retrieved February 16, 2003 from: *www.business2.com/articles/mag/0,1640,13310,FF.html*

CAE Company Overview. (n.d.). Retrieved January 28 from: *http://cae.com/en/about/index.shtml*

CAE Press Release. (2003). *CAE to develop seLearning™ courseware for ALSTOM power plants*. January 22. Retrieved February 18, 2003 from: *www.cae.com/en/newsroom/2003/shtml/power_01222003_ref066.shtml*

CAE SimuFlite. (2002). *CAE SimuFlite Premiers Boeing Business Jet Training Program with CAE Simfinity™ Technology*. September 10. Retrieved February 19, 2003 from: *www.simuflite.com/press/02_11pr.htmlCAESimuFlite*

CAE SimuFlite. (n.d.). *Power systems and simulation*. Retrieved February 19, 2003 from: *www.cae.com/en/power/index.shtml*

CAE SimuFlite Company History. (n.d.) Retrieved February 19, 2003 from: *www.caesimuflite.com/press/history.html*

Cyber terror the way of the future. (1999). *AAP General News (Australia)*. July 13. Retrieved February 19, 2003 from: *www.elibrary.com/*

Davis, F.D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, *13*(3), 319-340.

Delio, M. (2000, Aug). Report: Online training 'boring'. *Wired*. Retrieved February 16, 2003 from: *www.wired.com/news/print/0,1294,38504,00.html*

Greenburg, P. (2001). *CRM at the speed of light*. McGraw Hill.

Herold, D.M., Davis, W., Fedor, D.B., & Parsons, C.K. (2002). Dispositional influences on transfer of learning in multistate training programs. *Personal Psychology,* Winter.

Hsu, S., & White, J. (1998). *Developing holistic technology-based training programs*. Retrieved February 17, 2003 from: *www.viats.org/papers/session 5a2.htm*

Karp, M., Condit, D., & Nullmeyer, R. (1999). *F-16 cockpit/crew resource management*. (AL/HR-TR-1999-XXXX, in progress). Mesa, AZ: Air Force Research Laboratory *NBAA Business Aviation Fact Book* (2002). Retrieved January 28, 2003 from: *www.nbaa.org/factbook/2002/section4.htm#02*

Karp, M.R., McCurry, W.K., Turney, M.A., & Harms, D. (2000). *Aviation education for future airline pilots: An integrated model*. Retrieved February 17, 2003 from: *www.viats.org/papers/session5d4.htm*

Leher, H.R., Moore, P.J., & Telfer, R.A. (1999). *Approaches to learning: Is there a better way to prepare future pilots?* Retrieved February 17, 2003 from: *www.viats.org/papers/session 5d1.htm*

Mauro, R., & Barshi, I. (n.d.). *Using an Internet-based decision research system in aviation training research*. Retrieved February 17, 2003 from: *www.viats.org/papers/session5c2.htm*

Moore, G., & Benbasat, I. (1991, Sept). Development of an instrument to measure the perceptions of adopting an information technology innovation. *Information Systems Research, 2*(3), 192-222.

Rose, R.G. (2001). *Practical use of pilot personality profile*. February 8. Retrieved February 18, 2003 from: *www.avweb.com/news/aeromed/181606-1.html*

Sand, K., & Schoenfelder, J. (1998). *Simulation coupled with CBT creating a comprehensive training tool that increases transfer.* Retrieved February 17, 2003 from: *www.viats.org/papers/session5a4.htm*

Selvaratnam, S. (2002). Tool to create e-learning content. *Computimes Malaysia,* November 11.

Sherry, L. (1996). Issues in distance learning. *International Journal of Educational Telecommunications, 1*(4), 337-365. Retrieved February 19, 2003 from: *http://carbon.cudenver.edu/~lsherry/pubs/issues.html*

Small, R.L., Lakowske, S.D., Breese, J., & Callejo, G. (1999). *A future direction in pilot training*. Retrieved February 17, 2003 from: *www.viats.org/papers/session5d2.htm*

Stokes, S. (2000). Learning space enlivens online training. *Infoworld,* July 24.

Taylor S., & Todd, P. (1995, June). Understanding information technology usage: A test of competing models. *Information Systems Research*, *6*(23), 144-176.

Tomlinson, C.A. (1999). Mapping a route toward differentiated instruction. *Educational Leadership,* September.

Trapp, R. (1997). Internet users 'wide open to fraud.' *Independent*, Sept 3, C39. Retrieved February 19, 2003 from: *www.elibrary.com/*

United States General Accounting Office. (1999). *Aviation safety: Research supports limited use of personal computer aviation training devices for pilots* (GAO Report No. RCED-99-143). Washington, DC: U.S. Government Printing Office, July 12. Retrieved February 19, 2003 from: *www2.faa.gov/nsp/nsp/GAO_PCATD.txt FAA 1999*

Wentling, T.L., Waight, C., Strazzo, D., File, J., La Fleur, J., & Kanfer, A. (2000). The future of e-learning: A corporate and an academic perspective. *NCSA Knowledge and Learning Systems Group*, September.

APPENDIX A

Survey Instrument for Commercial Pilots

1. The online learning will be of no benefit to me.

StronglyDisagree			Neither AgreeNor Disagree			StronglyAgree
1	2	3	4	5	6	7

2. Using the online learning will improve my ability to get prepared for check ride.

StronglyDisagree			Neither AgreeNor Disagree			StronglyAgree
1	2	3	4	5	6	7

3. The advantages of the online learning will outweigh the disadvantages.

StronglyDisagree			Neither AgreeNor Disagree			StronglyAgree
1	2	3	4	5	6	7

4. Overall, using the online learning will be advantageous.

StronglyDisagree			Neither AgreeNor Disagree			StronglyAgree
1	2	3	4	5	6	7

5. Using the online learning will fit well with the way I take ground training.

StronglyDisagree			Neither AgreeNor Disagree			StronglyAgree
1	2	3	4	5	6	7

6. Using the online learning will fit into my work style.

StronglyDisagree			Neither AgreeNor Disagree			StronglyAgree
1	2	3	4	5	6	7

7. Instructions for online learning will be hard to follow.

StronglyDisagree			Neither AgreeNor Disagree			StronglyAgree
1	2	3	4	5	6	7

8. Using online learning will require a lot of mental effort.

StronglyDisagree			Neither AgreeNor Disagree			StronglyAgree
1	2	3	4	5	6	7

9. Using online learning is often frustrating

StronglyDisagree			Neither AgreeNor Disagree			StronglyAgree
1	2	3	4	5	6	7

10. I expect online learning would be clear and understandable.

StronglyDisagree			Neither AgreeNor Disagree			StronglyAgree
1	2	3	4	5	6	7

11. I expect online learning to be flexible to interact with.

StronglyDisagree			Neither AgreeNor Disagree			StronglyAgree
1	2	3	4	5	6	7

12. I expect it would be easy for me to become skilful at using online learning to get prepared for check ride.

StronglyDisagree			Neither AgreeNor Disagree			StronglyAgree
1	2	3	4	5	6	7

13. My friends would think that I should prepare for check ride through online learning.

StronglyDisagree			Neither AgreeNor Disagree			StronglyAgree
1	2	3	4	5	6	7

14. My fellow pilots would think that I should use online learning to get prepared for check ride.

StronglyDisagree			Neither AgreeNor Disagree			StronglyAgree
1	2	3	4	5	6	7

15. My supervisor would think that I should use the online learning to prepare for check ride.

StronglyDisagree			Neither AgreeNor Disagree			StronglyAgree
1	2	3	4	5	6	7

16. I will have to use online learning to conduct ground training because my supervisor may require it in the future.

StronglyDisagree			Neither AgreeNor Disagree			StronglyAgree
1	2	3	4	5	6	7

17. I would feel comfortable using the online learning on my own.

StronglyDisagree			Neither AgreeNor Disagree			StronglyAgree
1	2	3	4	5	6	7

18. If I wanted to, I could easily connect to get prepared for check ride through online learning on my own.

StronglyDisagree			Neither AgreeNor Disagree			StronglyAgree
1	2	3	4	5	6	7

19. There will not be enough computer resources for everyone to use for online learning.

StronglyDisagree			Neither AgreeNor Disagree			StronglyAgree
1	2	3	4	5	6	7

20. I won't be able to use computer resources for online learning when I need it.

StronglyDisagree			Neither AgreeNor Disagree			StronglyAgree
1	2	3	4	5	6	7

APPENDIX B

Acronyms

AERO	Aviation Education Reinforcement Option
AICC	Aviation Industry Computer-based Training Committee Standards
AT&T	American Telegraph & Telephone
CBT	Computer Based Training
CEO	Chief Executive Office
CRM	Customer Relationship Management
DVD	Digital Video Disk
ERP	Enterprise Resource Planning
FAA	Federal Aviation Administration
FMS	Flight Management System
FOQA	Flight Operations Quality Assurance
HDTV	High Definition Television
HTBT	Holistic Technology Based Training
IBM	International Business Machines
IDRS	Internet-based Decision Research System
JAVA	Programming Language Developed for the Web
MGT	Management
NASA	National Aeronautics and Space Administration
PRM	Partnership Relationship Management
SOLO	Structure of the Learning Outcome
US	United States
WML	Wireless Markup Language
XML	Extensible Markup Language

Mahesh S. Raisinghani is a faculty member at the University of Dallas, Graduate School of Management, where he teaches MBA courses in e-Business and information systems. Raisinghani was the recipient of the Presidential Award and the King Haggar Award for excellence in teaching, research and service. His previous publications have appeared in Information and Management, Information Resources Management Journal, Information Strategy: An Executive's Journal, Journal of Global IT Management, Journal of E-Commerce Research, Journal of IT Cases *and* Applications and International Journal of E-Business Research, *among others. He serves on the editorial review board for leading information systems publications and is included in the millennium edition of Who's Who in the World, Who's Who Among America's Teachers and Who's Who in Information Technology.*

Mohammed Shah Alam Chowdhury is an adjunct faculty member at the University of Dallas. He served as assistant professor of business administration at Jahangirnagar University and Chittagong University. He served as manager in the IT industry of Bangladesh. He has extensive experience in consulting, training and re-engineering at various SMEs in Bangladesh. He has several research publications in academic and professional journals and served on an editorial review board for the Journal of Business Administration. *He is a member of Sigma Iota Epsilon.*

Chris Colquitt is an aviation and aerospace professional, with more than 28 years of experience. After earning a BS in aerospace engineering from the University of Texas at Austin, he served as a pilot and officer in the United States Navy. After seven years in the Navy, he joined American Airlines and flew their flagships all over the globe. Later, he accepted a position as a systems matter expert for the U.S. Air Force KC-10 Pilot training program with Raytheon and a systems engineer for the U.S. Navy's new F18 Simulator development. While earning an MBA from the University of Dallas in Irving he flew as a pilot for Piedmont and trained and evaluated professional pilots at CAE SimuFlite. Currently he is on contract with NASA as a research pilot and aerospace engineer.

Pedro M. Reyes is an assistant professor in the Hankamer School of Business, Baylor University. He received his PhD in operations management, an MBA in operations management, an MS in information systems and a BS in mathematics from The University of Texas at Arlington. His current research interests are in integrated logistics, supply chain management and operations control. Reyes' research publications are included in Production and Inventory Management Journal, Journal of Global Information Technology, Knowledge and Process Management *and* Applied Mathematics and Computation*.*

Nilofar Bonakdar Kadivi is a visiting scholar at Mountain View College, Dallas County Community Colleges. She serves as a full-time faculty member responsible to teach in and direct the Department of E-Commerce. She has four years' experience teaching in the field of e-commerce and Web design. She holds a BS in economics from Azad University, Tehran, Iran, and an MBA in e-commerce from the University of Dallas.

Joseph M. Ray is a program manager for Pintail Technologies. He has extensive experience managing and developing complex software projects at several startup companies as well as several Fortune 500 companies. He has been involved in software systems in a variety of domains, including supply chain management, defense, finance and the semiconductor industry. Additionally, he has worked as a technical trainer, teaching hands-on software development classes. He holds an MBA in e-Business and a BS in computer science.

Jose E. Robles is a customer project leader at Nortel Networks. He has extensive experience in the definition, implementation and re-engineering of customer service business processes. While at Nortel Networks, Robles has served in various positions, ranging from Technical Services & Support to Service Introduction and Validation. Prior to service at Nortel Networks, Robles served in the U.S. Air Force. He holds a BBA in business management, MBA in information systems management and finance, and a Master of Management in e-commerce.