JOHN L. RICHARDSON, P.L.L.C.
555 13TH STREET, N.W.
SUITE 420 WEST
WASHINGTON, D.C. 20004
(202) 371-2258
(202) 828-0158 (FAX)
JRICHARDSON@JOHNLRICHARDSON.COM

March 13, 2007

Ms. Dorothy Beard
Chief, Documentary Services Division
U.S. Department of Transportation
400 7th Street S.W.
Room PL401
Washington D.C. 20591-0001

Re: Petition of Amerijet International, Inc. for an Exemption from §63.37(b)(1) and 63 Appendix C (a)(3)(iv)(a)

Dear Ms. Beard:

Amerijet International, Inc. is a supplemental scheduled all-cargo air carrier providing service within the United States and between points in the United States and points outside the United States. It has been issued exemptions and certificates by the Department of Transportation authorizing these operations, and it conducts its business as a corporation in good standing under the laws of the State of Florida and in accordance with Part 121 of Title 14 of the Code of Federal Regulations.

Amerijet respectfully submits this petition for an exemption from 14 Part 63.37(b)(1) and Appendix C to Part 63 to the extent necessary to permit it to train its airframe and powerplant mechanics so all the flight time requirement may be satisfied in Level C or D simulator. This is the same standard imposed on flight engineer trainees who possess a Commercial Pilot Certificate with instrument Rating under Appendix C to Part 63.

In support of its petition, Amerijet submits the following evidence and argument:

At the present time, Amerijet is required by Part 63 to include as part of its training program for its airframe and powerplant mechanics who want to become flight engineers "at least 5 hours of flight training in the duties of a flight engineer." See, Sections 63.37 (b)(1), 63.37 (b)(7) and Appendix C to Part 63, specifically paragraph (a)(3)(iv)(a) and (b). [1]

Amerijet submits that the aircraft flight time requirement of Part 63 is unnecessary; fails to recognize advances in simulator training technology and techniques; is wasteful; creates unnecessary risk and danger to the trainee, the flight crew and others; imposes unnecessary burdens and expense on Amerijet; and is otherwise inconsistent with the public interest. As a result, Amerijet respectfully requests that it be relieved of that requirement through the exemption sought hereby.

When the flight engineer training program set forth in Part 63 was adopted by the FAA four decades ago, simulation training was in its infancy. Since that time, great strides have been taken to the point that today simulators generally are thought of as superior to actual flying as a training device. Today's modern simulators are far more advanced than those described in Appendix C and offer far more diverse, rigorous and sophisticated training than could ever be achieved on the flight deck of a flying aircraft. In short, unlike the simulators of the 1960s, today's simulation training is markedly better than the training that can be provided through the use of an actual aircraft. Thus, the underlying premise for the Part 63 five-hour rule, that actual flight time must be part of the flight engineer training regime, is no longer valid.

In fact, and contrary to the working assumption of the Part 63 five-hour rule, modern thinking is to the effect that advanced simulator training is far superior to the use of an operating aircraft as the prospective flight engineer's classroom. The FAA itself has accepted this modern thinking institutionally and has adopted the principle as its own. In addition, there is an abundance of professional literature, some authored by officials of the FAA, testifying to the principle that is the bedrock of the Amerijet petition: that state of the art simulator training is to be preferred over training in an operating aircraft. Amerijet has gathered some of that

[1] Pertinent portions of Section 63 and Appendix C are restated in Appendix A attached hereto.

literature for incorporation herein and has provided references to other relevant and compelling resources. See, Appendix B attached hereto.

The benefit of advanced simulation training as a substitute for actual aircraft flight time training has also been documented by the FAA in FAR 121 Appendix H, whereby the FAA permits pilots to obtain their type rating in transport category aircraft and carry revenue passengers on their first flight as captain in the aircraft without ever having operated the actual aircraft, if they receive flight training in an advanced aircraft simulator.

Thus, unlike the situation that prevailed when the Part 63 five-hour rule was first adopted by the FAA, simulator training is today recognized by the FAA and the industry as far superior to trying to teach flight engineer duties in an operating aircraft. And, unlike the state of simulation technology that existed when other requests similar to this one were denied, simulation training today is so much more advanced that the underlying concerns reflected in the FAA's decisions to deny similar exemption requests are hard to square with current reality. In short, to the extent FAA evaluation of Amerijet's request turns on an analysis of the current state of simulation technology, the Earth has truly shifted over the last several years--so much so that Amerijet believes that if the FAA were writing Part 63 today, the five-hour flight rule would not even be included.

Although advances in simulation technology, in and of themselves, are a sufficient basis for granting this petition, the FAA should also consider other benefits that will be obtained through a grant of the requested exemption which demonstrate that approval of Amerijet's request is fully consistent with the public interest

First, safety will be enhanced and serious operational risks will be eliminated if the exemption is approved. Unnecessarily requiring a flight engineer trainee to occupy one of the flight deck positions of an operating aircraft solely for training purposes puts the other crewmembers and the aircraft at substantial risk. And requiring or permitting the trainee to exercise flight responsibilities on an operating aircraft while he is being trained involves further serious risk. Assumption of that risk may, in the past, have been considered necessary to assure that the candidate was adequately trained. In this age of advanced simulation technology, however, there is no legitimate need to assume that risk. One of the principal benefits of modern advanced simulation training is that it is very safe, involving no safety risk at all. Therefore, considerations of risk avoidance--indeed, the elimination of risk--clearly militate in favor of approval of this petition.

Another relevant public interest benefit that will result from approval of this petition relates to the quality of the training the engineer candidate will receive with a simulator compared to what he or she may receive in an operating aircraft. One of the characteristics of modern simulation training is that simulation permits the trainee to experience and learn from a far wider range of operational situations that can possibly be taught using an operating aircraft in actual flight. An operating aircraft is simply not a good classroom. Only a limited number of experiences can be shared during actual flight, and it is altogether too unsafe to push the training envelope very far. These limitations are eliminated with modern simulator training, and the resulting training experience is significantly enhanced.

While providing a superior training experience to those it wants to train, allowing Amerijet to use simulator training systems rather than actual flight training will also permit the carrier to benefit economically, another relevant public interest factor. First, Amerijet will benefit through the more economical use of its capital expenditures. Transport aircraft are, of course, very expensive, and, in today's economy, a carrier's aircraft acquisition cost must be budgeted and expended judiciously. Every hour an aircraft flies, its useful life is reduced, and part of the acquisition cost is expended. To the extent those flight hours are devoted to unnecessary training time rather than the production of revenue, the capital cost of the aircraft is wasted and the carrier suffers. Thus, because the cost of modern simulators is far lower than the cost of an aircraft, approval of this petition will permit Amerijet to realize significant economic benefits which will permit it to serve the public in a more effective and efficient manner.

The economic benefit to be realized by Amerijet from approval of this petition goes well beyond capital costs. For each hour of the five hours of flight training now required by Part 63, the air carrier must absorb the cost of the captain and copilot who accompany the trainee. The carrier must also absorb the huge and ever growing fuel cost involved, again without earning any offsetting revenues. And, of course, nonproductive flight time makes the periodic aircraft maintenance expenditure attributable to that flight time wasteful. While there is an operational cost involved in using a simulator, that cost pales into insignificance when compared to the cost of actual aircraft flight time.

In determining the public interest with respect to this request, it is also important to consider the environmental benefits that will be realized from using a training simulator and not having to consume aviation fuel during the more than five hours of flight training now required by Section 63. Amerijet has calculated that one of its jet transport aircraft will consume over 50,000 pounds of fossil fuel to train one flight engineer. At this rate, Amerijet may burn, with minimal training requirements, over a million pounds of fuel just to train its flight engineers in one year. This fuel use is equivalent to flying an Amerijet 727 around the world--twice. And it is a waste--an expensive waste--that can be eliminated through approval of this petition.

Another public interest benefit which will result from granting this exemption involves the elimination of the unnecessary use of crowded air space by a training aircraft and the resulting reduction in the burden on the already overburdened air traffic control system. Each time the FAA is able to reduce the use of the system through the elimination of an unnecessary operation, the system benefits and FAA's operating costs decline. And such a result will clearly occur if this petition is granted.

Issuance of the proposed exemption also would have no adverse effect on public safety. Indeed, as noted, it is very likely that public safety will be improved by approval of this request. Moreover, high public safety standards will be maintained because following certification, flight engineers will still be required under Part 121 to obtain operating experience under the supervision of a check engineer or other properly appointed flight engineer to insure that the training he received satisfies the highest standards. As a condition to the exemption requested, the flight engineer trainee, after completing simulator training, would be issued a restricted certificate (reflecting conditions similar to those set forth in

ATA Exemption 4901) which would only be satisfied following completion of a period of actual flight experience. In addition, the FAA can assure that approval of this petition will not result in the derogation of safety standards through the imposition of the following conditions to approval, all of which Amerijet will readily accept:

1. Amerijet will notify its Certificate Holding District Office (CHDO) prior to the initiation of any training under this exemption.

2. Amerijet will keep records for all persons trained under this exemption that specifically identify the trainee as having been trained under the exemption.

3. Amerijet will provide the CHDO with the results of engineer training accomplished under the exemption.

In summary, Amerijet believes that approval of this petition and grant of the requested exemption would be fully consistent with the public interest. Safety will not be compromised; it will be enhanced. Amerijet will be permitted to realize substantial economic benefits without diminishing its commitment to high standards of safety. The substitution of simulation for actual flight time will ease the burden on the FAA's air traffic control system, minimize fuel use and enhance air quality. For all these reasons, Amerijet respectfully requests that its petition be approved.

Amerijet also requests that the FAA waive the requirement for *Federal Register* publication because the exemption, if granted, would not set a precedent in the sense that no training reductions are requested, only a substitution of training method comparable to that already in existence for pilots holding a commercial pilot certificate with an instrument rating, and any delay in acting on this petition would be detrimental to the public and Amerijet.

Respectfully submitted,

John L. Richardson
Counsel for Amerijet
International, Inc.

Enclosures

SUMMARY FOR FEDERAL REGISTER

1. Section 63.37(b)(1) prescribes, in pertinent part, that aircraft and aircraft engine mechanics with 3 years of diversified practical experience, 1 year of which was in maintaining engines rated at least 800 horsepower, to qualify as flight engineers provided they accomplish 5 hours of flight training in the duties of a flight engineer.

2. Section 63, Appendix C-Flight Engineer Training Course Requirements, in paragraphs (a)(3)(iv)(a) prescribes, in pertinent part, that 10 hours of flight training in an airplane are required, which may be reduced to 5 hours via simulator or training device except for (b) commercial pilots with instrument ratings which can be accomplished totally in a simulator. Mechanics completing the Appendix C training course must accomplish at least 5 hours in an airplane.

3. The exemption, if granted, would permit Amerijet International to select and train their A&P mechanics who otherwise meet 63.37(b)(1) without having to accomplish the 5 hours of training in airplanes, but instead accomplish more thorough and comprehensive training in simulators providing far more training scenarios than can be safely accommodated in an actual aircraft. The training would be safer and more ecological, and at a cost savings by not having to consume several thousand gallons of jet fuel for aircraft training. Further, the A&P mechanics trained to become flight engineers would bring a greater depth of equipment and systems knowledge to the position, rendering a safer operating environment.

APPENDIX A

Section 63.37(b)(1) prescribes, in pertinent part, that "an applicant for a flight engineer certificate with a class rating must present, for the class rating sought, satisfactory evidence of one of the following: (1) At least 3 years experience in aircraft and aircraft engine [today referred to as airframe and powerplant] (of which at least one year was in maintaining multiengine aircraft with engines rated at 800 horsepower each, or the equivalent in turbine engine powered aircraft), and at least 5 hours of flight training in the duties of a flight engineer."

Section 63.37(b)(7) further prescribes for certification as a flight engineer, in pertinent part, that "[w]ithin the 90-day period before he applies, successful completion of an approved flight engineer ground and flight course of instruction as provided in appendix C of this part."

Appendix C to Part 63-Flight Engineer Training Course Requirements as described in paragraphs (a)(3)(iv)(a)(b), states, "[i]f the Administrator finds a simulator or flight engineer training device to accurately reproduce the design, function, and control characteristics, as pertaining to the duties and responsibilities of a flight engineer on the type of aircraft to be flown, the flight training may be reduced by a ratio of 1 hour of flight time to 2 hours of airplane simulator time, or 3 hours of flight training device, as the case may be , subject to the following limitations: (a) Except as provided for in subdivision (b) of this paragraph, the required flight instruction time in an airplane may not be less than 5 hours."

Appendix C paragraph (a)(3)(iv)(b) states, "[a]s to a flight engineer student holding at least a commercial pilot certificate with an instrument rating, airplane simulator or a combination of airplane simulator and flight engineer training device time may be submitted for up to all 10 hours of the required flight instruction time in an airplane. However, not more than 15 hours of flight engineer training device time may be substituted for flight instruction time."

APPENDIX B

FAA Advisory Circular 120-45A, issued on February 5, 1992 sets forth the FAA's position on training devices in general. It also refers to significant advances in simulation technology which were recognized in 1992—fifteen years ago—and it calls for additional training credits to be given to simulator training devices that were available at that time. In the subsequent fifteen years, simulator technology has only continued to advance. This excerpt from paragraph 5 of AC 120-45A clearly recognizes the enhanced value of training with training devices.

"The primary objective of flight training is to provide a means for flight crewmembers to acquire the skills and knowledge necessary to perform to a desired safe standard. Flight simulation provides an effective, viable environment for the instruction, demonstration, and practice of the maneuvers and procedures (called training events) pertinent to a particular airplane and crewmember position. Successful completion of flight training is validated by appropriate testing, called checking events. ***The complexity, operating costs, and operating environment of modern airplanes, together with the technological advances made in flight simulation, have encouraged the expanded use of training devices and simulators in the training and checking of flight crewmembers. These devices provide more in-depth training than can be accomplished in the airplane and provide a very high transfer of skills, knowledge, and behavior to the cockpit. Additionally, their use results in safer flight training and cost reductions for the operators, while achieving fuel conservation, a decrease in noise and otherwise helping maintain environmental quality.***

The FAA has traditionally recognized the value of training devices and has awarded credit for their use in the completion of specific training and checking events in both general aviation and air carrier flight training programs and in pilot certification activities. Such credits are delineated in FAR Part 61 and Appendix A {Part 61, Appendix A no longer exists - Ed. See Part 61.} of that part; FAR Part 121, including Appendices E and F; and in other appropriate sources such as handbooks and guidance documents. These FAR sources, however, refer only to a "training device," with no further descriptive information. Other sources refer to training devices in several categories such as Cockpit Procedures Trainers, Cockpit Systems Simulators, Fixed Base Simulators (commonly referred to as CPT, CSS, and FBS, respectively), as well as other descriptors. These categories and names have had no standard definition or design criteria within the industry and, consequently, have presented communications difficulties and inconsistent standardization in their application. Furthermore, no single source guidance document has existed to categorize these devices, to provide qualification standards for each category, or to relate one category to another in terms of capability or technical complexity. As a result, approval of these devices for use in training programs has not always been equitable." (Emphasis added. Paragraph numbers deleted.)

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Advisory Circular 120-35C, issued by the FAA on September 27, 2004, addresses the concept of training in the line environment as opposed to practicing a specific maneuver until proficient. One of the FAA's concerns expressed in response to other similar petitions for exemptions filed in the past reflected a disposition that simulator training may not provide sufficient exposure to the routine ATC or crew environment aspects of air carrier operations. This AC suggests a way to assure parity—if not superiority--through the use of simulator technology which would fully remove the concern about simulator training the FAA has expressed in the past. Having noted that simulation technology gives training carriers the ability to conduct normal, abnormal, and emergency situational training, there would appear to be no benefit to training in an operating aircraft. Amerijet's petition for an exemption contemplates Line Operational Simulations as part of the programmed flight training curriculum.

"Foreword

1. PURPOSE. This advisory circular (AC) presents guidelines for the design and implementation of line operational simulations (LOS), including line-oriented flight training (LOFT), special purpose operational training (SPOT), and line operational evaluation (LOE). This document does not interpret the regulations; interpretations are issued only under established agency guidelines. As operators develop LOS, they should develop an interdependent relationship between their Human Factors, crew resource management (CRM), flight operations, and safety initiatives since they are linked to a common safety goal.

...

6. BACKGROUND.

a. ***The use of gate-to-gate flight simulator scenarios, known as LOFT, began in the mid-1970s as a means to provide pilot training that is more representative of actual flight operations than is maneuver-based training alone. LOFT was soon recognized as a highly effective means of developing and practicing CRM skills.*** Due to the role of CRM issues in accident causation, it has become evident that training curriculums must develop pilot proficiency in both technical and CRM skills. While LOFT is designed to include all phases of flight, scenario-based training may also include limited portions of flight designed to focus on specific operational training needs, known as SPOT. Air carriers with an approved AQP must also conduct evaluated LOFTs, known as LOE, for jeopardy grading purposes. ***These three methodologies, LOFT, SPOT, and LOE, are now grouped under the general heading of LOS.***

b. The introductory CRM training that many flight crewmembers have experienced is similar to the foundation of a building: It is an essential structural part, but by itself the foundation has limited operational use. If CRM training is to be operationally effective, it must be built into other training steps and activities in a systematic way. A structured LOS design process is employed to specify and integrate the required CRM and technical skills into line operational LOS scenarios.

c. LOS is an environment that is structured to allow and encourage the application of technical and CRM concepts to a situation that enables conceptual knowledge to become working knowledge. *Instead of being programmed with a solution, the crew can manage the operational environment and process available information to learn its limits, properties, and operational relevance. LOS can be conducted in a simulator or flight training device (FTD), depending on whether the LOS is for training or evaluation, and the requisite fidelity of the training/evaluation media.*

d. Much of the information in this AC stems from a working paper developed by the Airline Transport Association Training Committee, AQP Subcommittee, LOFT Design Focus Group. This AC provides a structured design process for LOS design and implementation and builds upon air carrier experience with developing and implementing scenarios to provide guidelines for LOS programs.

7. REQUIREMENTS AND CONCEPTS

a. LOFT is a useful training method because it gives crewmembers the opportunity to practice line operations (e.g., maneuvers, operating skills, systems operations, and the operator's procedures) with a full crew in a realistic environment. Crewmembers learn to handle a variety of real-time scenarios that include routine, abnormal, and emergency situations. They also learn and practice CRM skills, including crew coordination, judgment, decisionmaking, and communication skills. The overall objective of LOFT is to improve total flightcrew performance, thereby preventing incidents and accidents during operational flying. Since the early 1980s, new issues that are related to the requirements of section 121.409, part 121, appendix H, and expanding opportunities for the use of LOFT or other LOS have emerged. Requirements include:

(1) Section 121.409. Section 121.409(b) delineates the requirements of recurrent LOFT, which may be substituted on an alternate basis for the proficiency training requirement as specified in section 121.441. Section 121.409(b) requires a complete crew to be used in recurrent LOFT, but does not provide detail on what constitutes a complete crew. The guidance provided in this AC recognizes a complete crew as one that is line qualified or line familiar (see definitions in paragraph 4).

(2) Part 121, appendix H. Appendix H contains rules for operators who choose to provide flight crewmember training under an Advanced Simulation Plan. While appendix H provides a detailed description for implementing training, the specific LOFT components are not clearly described. This AC presents guidelines for implementing qualification LOFT as required under appendix H or as may be used within any other approved training program. This AC discusses how qualification LOFT is designed to help flight crewmembers transition from a training environment to operational flying.

a. Briefing. Before the flight segment begins, the instructor should brief crewmembers on the LOS scenario, including the training objectives, and the role of the instructor (i.e., the instructor is considered "not present," except as an air traffic controller (ATC) or as another ground base entity). The role of the flightcrew should be discussed in the briefing (i.e., flight crewmembers should perform their duties just as they would in line operations). Information about "the environmental setting of the scenario" should also be discussed.

b. Preflight Planning Documents and Activities. Preflight planning documents (e.g., weather reports and flight plans) should be prepared with the operator's particular training objectives in mind. For example, the operator may choose to have crewmembers learn how to handle unfavorable weather conditions or how to correct improper fuel loads. Preflight activities include cockpit setup, computation of takeoff data, etc.

c. Flight Segment. The flight segment includes taxi, takeoff, climb, cruise, descent, and landing, as appropriate. It should also include the time in which communication with ATC and other ground agencies takes place.

d. Debriefing. Debriefing should include feedback to crewmembers on their performance. Positive comments regarding crew performance should be emphasized in the debriefing as well as crew performance that needs improvement. The debriefing involves instructor critiques of individual crewmembers and of the crew as a team. Also, it is important that crewmembers be given the opportunity to critique and analyze their own performance and review key points of the video record, if used (see paragraphs 314 and 316 for further discussion of critiques, debriefing, and use of video records). (Emphasis added.)

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Advisory Circular 120-40B, issued on June 9, 1993 is very much to the same effect as AC 120-45, but more clearly discloses the FAA trend toward permitting more and more training to be accomplished in simulators. In 1993, virtually all air carrier pilot training was conducted in simulators.

"5. BACKGROUND.

a. The availability of advanced technology has permitted greater use of flight simulators for training and checking of flight crewmembers. The complexity, costs, and operating environment of modern aircraft also has encouraged broader use of advanced simulation. Simulators can provide more in-depth training than can be accomplished in airplanes and provide a very high transfer of learning and behavior from the simulator to the airplane. The use of simulators, in lieu of airplanes, results in safer flight training and cost reductions for the operators. It also achieves fuel conservation and reduction in adverse environmental effects.

b. As technology progressed and the capabilities of flight simulation were recognized, FAR revisions were made to permit the increased use of simulators in approved training programs. Simulators have been used in training and some checking programs since the middle 1950's. ***Various FAR amendments gradually permitted additional simulator credits.*** The most significant recognition of simulator capability has occurred since the early 1970's. In December 1973, FAR Amendments 61-62 and 121-108 permitted additional use of visual simulators. Amendments to FAR § 121.439 permitted simulators approved for "the landing maneuver" to be substituted for the airplane in a pilot recency of experience qualification. These changes to the FAR constituted a significant step toward the development of Amendments 61-69 and 121-161 issued June 24, 1980, which contained the FAA Advanced Simulation Plan. To support this plan, the National Simulator Evaluation Program was established by the FAA in October 1980. The program is administered and directed by the NSPM.

c. The need for standard criteria was necessitated by the use of simulators for training and checking. The evolution of the simulator technology and the concomitant increased permitted use has required a similar evolution of the criteria for simulator qualification. A listing of known simulator criteria should, therefore, be informative. The qualification basis for a given simulator may be any of the past criteria, depending on when the simulator was first approved or last upgraded. The following list provides the effective dates of simulator qualification criteria documents:

FAR Part 121, Appendix B 1/9/65 to 2/2/70
AC 121-14 12/19/69 to 2/9/76
AC 121-14A 2/9/76 to 10/16/78
AC 121-14B 10/16/78 to 8/29/80
FAR Part 121, Appendix H 6/30/80 to Present
AC 121-14C 8/29/80 to 1/31/83
AC 120-40 1/31/83 to 7/31/86
AC 120-40A 7/31/86 to 7/29/91

Each of these documents has addressed the greater complexity represented by succeeding generations of simulators. Complexity of the highest level is not, however, required of all simulators. In fact, simulators are divided into levels that authorize additional training and checking with increased simulator capability. Until the advent of the Advanced Simulation Plan, there were two levels of simulators - nonvisual and visual. Some visual simulators were approved for "the landing maneuver." The Advanced Simulation Plan introduced three additional levels - Phase I, Phase II, and Phase III. Those visual simulators previously approved for "the landing maneuver" were incorporated into Phase I.
The training and checking credits for nonvisual and visual simulators were delineated in FAR Part 61, Appendix A {Part 61, Appendix A no longer exists - Ed. See Part 61.}, and FAR Part 121, Appendices E and F. Credits for Phases I, II and III were contained in the Advanced Simulation Plan. Four levels of simulators were, therefore, addressed; Basic (nonvisual and visual simulators), Phase I, Phase II, and Phase III. Each of the four levels is progressively more complex than the preceding level and each contains all the features of preceding levels plus the requirements for the designated level. As the technology has advanced, so has the qualification guidance. Efforts to keep the criteria updated are, therefore, ongoing with active participation from both industry and government resources. " (Emphasis added.)

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INITIATIVE TOWARDS MORE AFFORDABLE FLIGHT SIMULATORS FOR U.S. COMMUTER AIRLINE TRAINING

Thomas Longridge, Manager, Advanced Qualification Program
Paul Ray, Manager, National Simulator Program
Federal Aviation Administration, Washington D.C.
Edward Boothe, Consultant, Flight Simulation and Training
Atlanta, Georgia
Judith Bürki-Cohen, Engineering Psychologist, Volpe National
Transportation Systems Center, Department of Transportation
Cambridge, Massachusetts
United States of America

Abstract

Recent regulatory action, coupled to a policy of encouraging commuter airlines to conduct all pilot training and checking activities in ground based equipment, has created an impetus to consider how best to ameliorate the conditions which have discouraged the use of such equipment for pilot recurrent training by commuter airlines in the United States. This paper compares the relative merits of permitting additional recurrent training credit for enhanced flight training devices versus revising the qualification standards for Level B full flight simulators to achieve enhanced affordability. The current status of an ongoing Level B flight simulator qualification standards review, results to date, and future plans, including plans for the development of a comprehensive applied research program, are discussed.

Background

The use of flight simulators for initial and recurrent pilot training by U.S. major airlines is universal, and its effectiveness is well recognized. However, the use of such equipment by smaller U.S. commuter airlines is mixed. While many commuter airlines use approved simulator resources available from aircraft manufacturers and training centers for initial pilot certification, smaller airlines frequently do not make use of such equipment for recurrent pilot training, due to various considerations, such as cost, convenience, and flight simulator availability. For airlines employing small aircraft, the per hour cost of operating an aircraft for training may compare favorably with the cost of contracting for simulator time. For some commuter aircraft, simulator resources may be very limited in availability, and they may be inconveniently located geographically for U.S. operators.

On 20 December 1995, the Federal Aviation Administration (FAA) issued a new regulation (Ref 1) applicable to all airlines that operate scheduled air carrier service in airplanes having ten or more passenger seats. This new regulation, Part 119 of Title 14, Code of Federal Regulations (14 CFR), encompasses all scheduled commuter airlines that operate airplanes of 10 or more seats under 14 CFR, Part 135. Among its provisions, it requires all such airlines to conduct pilot training and evaluation in accordance with the same provisions of the Federal Aviation Regulations (FAR) that apply to major airlines, namely 14 CFR, Part 121. These changes are intended to encourage one standard of safety for all air carriers, regardless of the size of their aircraft or the range of their flight operations. **In concert with these new rules, the FAA has adopted a policy of encouraging commuter airlines to transition their pilot training programs out of the aircraft and into ground-based training equipment.** However, it is likely the effective realization of this policy will not occur.

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Abstract

Military Psychology

1992, Vol. 4, No. 2, Pages 63-74
(doi:10.1207/s15327876mp0402_1)

Flight Simulator Training Effectiveness: A Meta-Analysis

Robert T. Hays, John W. Jacobs, Carolyn Prince, Eduardo Salas

A meta-analysis of flight simulation research was conducted to identify important characteristics associated with the effectiveness of simulator training. Some 247 articles, research reports, and technical reports were located, from which 26 experiments were identified as having sufficient information for statistical meta-analysis. The major finding was that the use of simulators combined with aircraft training consistently produced improvements in training for jets compared to aircraft training only. Use of motion cuing added little to the training environments for jets. The average effectiveness of performance-paced training was greater than that for lock-step training. In general, training outcomes appear to be influenced considerably by the type of task and the amount and type of training given.

Reference Type: Report
Author: Blickenderfer, B., Liu, D., Hernandez, A.
Year: 2005
Title: Simulation-based training: Applying lessons learned in aviation to surface transportation modes
Institution: Embry Riddle Aeronautical University
Date: June 30
Author's Affiliation and Title: Embry Riddle Aeronautical University
Recipient's Affiliation and Title: Center for Advanced Transportation Systems Simulation (CATSS)

Abstract: (Executive Summary) After reviewing the literature regarding simulation for aviation training and reviewing the literature on use of simulation in surface transportation, a number of lessons learned become apparent.

Lesson Learned 1: Simulation has been proven to be an effective educational and instructional tool. In tests of flight simulator training effectiveness, trainees develop knowledge and skills in simulated systems as well as they do in the actual systems (Hays, Jacobs, Prince, & Salas, 1992). The simulator is an excellent classroom, as the learner is able to make mistakes and learn from them (Duncan & Feterle, 2000). The instructor is allowed to focus on teaching and not operating the vehicle. Additionally, many simulators have the capability to collect performance measures during the training scenarios that can help assess competencies and deficiencies. Not as much research has occurred regarding the effectiveness of training via simulation in the surface transportation domain compared to the aviation field, yet considerable research support has appeared. It is likely that the results regarding simulator effectiveness for aviation training will generalize to the surface transportation domain, but simulation must be used wisely. Users should consider the competencies needed to perform the task and the capabilities of the simulator. Not all simulators are appropriate for training all competencies. Furthermore, not all competencies require simulation for effective training.

Lesson Learned 2: Simulators increase safety and reduce training costs. As noted in our review of the aviation literature, two main benefits of using simulation for training are increased safety during training and reduced training costs.

In terms of safety, using simulators for training enables individuals to practice in conditions that would be too dangerous to train in actual situations (for example, aircraft engine failures, accidents, and other emergencies). This is also true when training driving and will likely be a major benefit of using simulation in surface transportation training.

Regarding cost, aviation simulation saves aircraft fuel, aircraft maintenance costs, and keeps aircraft available for revenue producing activities. In the case of automobiles, buses, and trucks, although training via simulation would conserve fuel, the cost savings are most likely not as great as they are in aviation. Indeed, considerable driving training can occur in the actual vehicles at low cost. Training train operators, on the other hand, may benefit from significant cost savings as well as benefiting from the simpler logistics of training via simulators rather than actual trains.

A benefit related to both safety and cost is that simulation can be used to give trainees experiences with unusual events. Unusual events are just that—unusual. Despite their rare occurrences, they can prove deadly in aviation as well as in surface transportation. Simulation offers the opportunity for drivers to experience these and learn how to perform effectively in these unusual situations (Down, Petford, & McHale, 1982). Consider driver training. Driving around in the real world, the driver may not encounter many, if any, hazardous or emergency situations. Using simulation, the scenario can be scripted to include a variety of hazards and emergencies. Thus, not only will simulation training give driver trainees the opportunity to master the knowledge and skills necessary to perform effectively in hazardous situations, but also it will do so in a safe environment.

Lesson Learned 3: Simulation alone does not equal training. Simulation is a tool for trainers to use (Salas, Bowers, & Rhodenizer, 1998). Simply experiencing a simulated environment is not
effective training (Salas et al., 1998). Simulation must be used in a thoughtful, well-planned manner that includes identification of training needs, proper design of scenarios, appropriate performance measurement, and feedback to the learner (Oser et al., 1999). The same principles apply in surface transportation as well (Uhr et al., 2003).

Lesson Learned 4: Simulation is one variable in the "big picture" of training effectiveness. Training effectiveness is a complex problem (Cannon-Bowers et al., 1995, Colquitt et al., 2000, Baldwin and Ford, 1998). Training method (e.g., use of simulation) is one variable involved. Numerous other variables also exist including trainee characteristics, work environment characteristics, and the transfer environment. Simulation training will not solve every training challenge for any domain.

Lesson Learned 5: The Scenario Based Training model (Oser et al., 1999) is one method to ensure simulation is used appropriately. Aviation training researchers advocate using the scenario based training model to use simulation effectively. While a few papers have appeared in the surface transportation training literature regarding effective use of simulation (Uhr et al. 2003; Nagata & Kuriyama, 1983; Walker & Bailey, 2002; Down et al. 1982), limited advice exists regarding the use of simulation effectively in this domain. Fortunately, the basic principles of the Oser et al (1999) model apply to surface transportation and, if advocated in the surface field, can help instructors to use driving simulator systems most effectively. The Oser et al. approach is based on basic principles of learning. This approach guides training designers to 1) identify the task/mission and the knowledge, skills, and abilities involved; 2) design scenarios to include events which allow the trainee to develop and practice the specific knowledge, skills, and abilities identified; 3) design performance measures to enable the trainer to assess performance; and 4) ensure specific feedback is given to the trainee.

Lesson Learned 6: Effective human performance measurement is crucial both for simulation validation and assessing skill development. As new simulators are developed, validation must occur. Validation should occur not only from the engineering/system performance standpoint but also from the human performance perspective (Hays & Singer, 1989). For example, when examining whether performance in a simulator equals performance in the real-world task, accurate, reliable human performance measures are essential to understand the human interactions with the system. Without such measures, it will be impossible to quantify training transfer. Both objective and subjective measurement approaches exist. Careful time and attention should be paid to developing and selecting the appropriate measures to ensure a well-rounded assessment of skills.

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OTHER RESOURCES

AQP Web sites:

http://www.faa.gov/education_research/training/aqp/ (public access)

FAA Resources:

• Title 14 CFR part 121, subpart Y: Advanced Qualification Program

FAA Advisory Circulars:

AC 120-35, Line Operational Simulations (as amended)

AC 120-40, Airplane Simulator Qualification (as amended)

AC 120-45, Airplane Flight Training Device Qualification (as amended)

AC 120-46, Use of Airplane Flight Training Devices (as amended)

AC 120-51, Crew Resource Management Training (as amended)

ATA AQP Working Group: Focus Group Reports:

• Line Operational Simulations: LOFT Scenario Design, Conduct and Validation
• Advanced Qualification Program Instructor/Evaluator Task Analysis
• Applied ISD in AQP Development: Front End Analysis
• Advanced Qualification Program Data Management Guide, Second Release

AFS-230 Products:

• Advanced Qualification Program Overview, powerpoint briefing (as amended)
• Advanced Qualification Program (AQP) Inspector Training (Student Guide, Leader Guide, Reference Book, Lab Book, Slides)
• Overview of the Advanced Qualification Program (by T. Longridge)

Generic Documents:

• Generic AQP Application
• Generic Single Visit Training Program Application
• Generic Single Visit Training Plan
• Generic Pilot Job Task List
• Generic Pilot Job Task Analysis

Research Papers:

• Scientific Evaluation of Aircrew Performance
• Application of Psychometrics to the Calibration of Air Carrier Evaluators [with UNM]
• Line Operational Evaluation (LOE) Air Carrier Scenario Based Evaluation
• Skills Development and Assessment in the AQP Environment
• Initiatives Towards More Affordable Flight Simulators for U.S. Commuter Airline Training
• Simulator Fidelity Requirements: The Case of Platform Motion
• Simulator Platform Motion -- The Need Revisited
• Simulator Fidelity: The Effect of Platform Motion
• Relationship Between Objective Measures of Pilot Performance/Behavior and Instructor Grades
• The Effect of Simulator Motion on Pilot Training and Evaluation
• Implementing the Model AQP Database: Lessons Learned
• Data Collection and Analysis: The Next AQP Frontier
• Reconceptualizing Leadership and Followership for Event-Based Training

Research Integrations:

• Training Approaches and Considerations For Automated Aircraft: A Summary of Training Development Experiences