USE OF TRAINING DEVICES IN GENERAL AVIATION TRAINING PROGRAMS

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While several studies have been done regarding the effectiveness of various training devices in general aviation, not much is known about how they are actually being used by flight schools. This study was designed to gain insight into the way flight schools use training devices. This study surveyed 184 flight schools to gather data about demographics, certification information about their devices, and which tasks are being taught at which level of training in each of the types of devices. Seventy schools responded. The results show that 1) the use of training devices is more prevalent in FAA approved flight schools than other schools, 2) there is some confusion about device certification requirements, 3) training time does not appear to be correlated with the use of these devices, and 4) most of the tasks taught are focused on instrument pilot certification, 5) some schools appear to be using training devices for non-instrument tasks.

INTRODUCTION

Aviation training devices are finding their way into more flight schools than ever before in the past. A recent study of 354 flight schools revealed a total 724 training devices in use (Wiggins, Hampton, Morin, Larssen, & Troncoso, 2002). Of these devices, 381 flight training devices (FTDs), 224 personal computer aviation training devices (PCATDs), and 99 training aids (TA) were reported in use. Most of these devices were used in FAA approved training programs under 14 CFR Part 141 (Part 141) in university-based programs and traditional approved flight schools. Use of these types of devices is not prevalent in schools operating under 14 CFR Part 61 (Part 61). Many of these schools were discovered to be smaller operations where there may not be sufficient resources available to justify the cost or use of these devices.

Increasing capabilities and lowering costs are contributing to this increased use. FTDs and PCATDs have become more usable and realistic, prompting several studies on the usefulness of these devices and how well the training conducted in them transfers to training in airplanes (Lintern, Roscoe, Koonce, & Segal, 1990; Hampton, Monroney, Kirton, & Biers, 1994; Taylor, Lintern, Hulin, Talleur, Emanuel, & Phillips, 1997). These studies all showed positive transfer of training benefits. Studies have been conducting using training devices to teach cognitive skills such as decision-making and situational awareness (Craig, 1999; Wilt, 1997). Benefits from the use of these devices range from the ability to train in less time, train in situations normally considered hazardous in actual flight, to lowering costs.

What is not revealed by any of these studies is how various aviation training devices are actually being used in training programs in general aviation. While guidance exists regarding the certification requirements of these devices (FAA, 1992, FAA 1997), it is not fully known if the devices in use are being used in accordance with these guidelines. Another issue that is not well understood is which areas of operation (AOO) and/or tasks are being targeted for instruction in training devices.

The purpose of this study was to reveal the types of training devices in use, how they are being used to enhance skill and proficiency, which tasks are being taught in these devices, whether or not the devices are appropriate certified and being used in accordance with National Simulator Program (NSP) guidelines, and if they are being used to augment training outside of approved training curricula.

METHOD

This study targeted schools that had previously indicated use of at least one training device in the study by Wiggins, Hampton, Morin, Larssen, & Troncoso (2002). Ultimately 184 schools were targeted for this study. The targeted training curricula were those for private pilot and commercial pilot certification and instrument and multiengine ratings.

A survey was used to collect data in three primary areas: school demographics, device information, and tasks taught in training devices. Part I of the survey collected data regarding school enrollments, hours used by various devices, and training times to certification flown by students. Part II of the survey collected information about the devices, use of these devices in approved training programs, and certification information. Part III investigated which tasks are being taught. In an attempt to standardize terminology, the Practical Test Standards (PTS) were used as the primary reference. Common or similar AOOs from the four PTSs were combined in an attempt to have tasks listed only once. This resulted in 15 AOOs on the survey. Tasks from each PTS were placed under the most appropriate AOO. For each tasks, data was collected on the type of device used, at which level of training that task was taught, and on which learning domain the training was focused (knowledge, skill, or attitude). Representatives from the Federal Aviation Administration from the headquarters office and the NSP office reviewed the instrument. A small pilot test by three chief flight instructors was also conducted. Because the survey was somewhat complex, a set of instructions along with examples of how to complete it correctly were included in the package mailed to each school. The surveys were distributed to the targeted schools along with a cover letter explaining the purpose of the study. Follow up activities consisted of a second mailing and a minimum of three telephone calls to each non-responding school.

RESULTS

Of the 184 schools targeted, 70 (38%) responded: 35 universities, 22 Part 141 schools, and 13 Part 61 schools. Universities had the highest response rate of 53.8% while Part 141 schools and Part 61 schools had response rates of 36.1% and 22.4% respectively. The number of student enrollments totaled 9258 with an average enrollment of 134.2 students per school. Sixty-eight schools provided data about which regulation under which they conduct their training. Forty-eight indicated they conduct training under both Part 61 and 141 while only four conduct training solely under Part 141.Sixteen conduct training solely under Part 61. Table 1 depicts the student training hours to certification.

Table 1

Student Training Hours to Certification

	Private	Commercial	Instrument	Multi-engine
Avg	54.4	104.8	47.0	17.9
Max	75	710	148	87
Min	31	10	12	7
N	52	44	49	41

N= number of schools reporting data

Data were collected regarding how much the devices were used. These data are depicted in Table 2. Averages are for those schools that reported use in each type of device. Data for airplanes is included for reference.

Table 2

Training Hours by Device Type

	Airplanes	FTD	PCATD	TA
Avg/wk/school	442.8	71.1	35.9	51.5
Avg/enroll/school	138.4	165.9	110.4	23.7
Avg/wk/student	3.1	0.4	0.3	2.2
N	65	47	33	6

N = number of schools reporting data on type of devices used.

Data were also collected about use of devices outside of training curriculums for either familiarization or remediation purposes. Eighteen schools reported students who initiate use of training devices on their own for an average of 5.9 hours per student. Fifteen schools

reported instructors who initiate use of training devices outside of their curricula for an average of 6.2 hours per student.

In an attempt to see if the use of FTDs by flight schools was significantly correlated with the course completion hours in each of the four courses, some statistical analyses were conducted. The data were divided at the median hour figure and the two groups were compared. The median figure for FTDs hours/week was 10 hours per week with 3 schools reporting 10 hours per week. No significant difference was noted in any of the four courses. The data are shown in Table 3.

Table 3

FTD Use Verses Course Completion Mean Hours

	Priv	Comm	Instrument	Multi
10 or fewer hours/week N = 33	54.1	94.4	46.90	19.7
More than 10hours/wk N = 36	53.5	111.9	45.5	15.1
t-score	.841	1.274	.480	-1.08
Significance	.404	.210	.634	.238

A similar comparison was made based on PCATD use. The median of the hours/week was 1.25 hours/week. Again, a comparison was made between those above and below the median. The data are shown in Table 4.

Table 4

PCATD Use Verses Course Completion Mean Hours

	Priv	Comm	Instrument	Multi
Less than 1.25 hours/week N = 32	55.0	90.1	45.6	15.7
1.25 or more hours per week. N = 32	54.3	121.7	47.5	21.2
t-score	.109	-.878	-.144	-1.371
Significance	.914	.385	.886	.178

As with FTD use, no significant difference was found between group time to completeion for PCATDs. However, these data are correlational and do not address causality. Thus it is possible that subjects completed the course with similar hours because they did use the training devices more and perhaps if they did not, then there might have been a statistical difference between the two groups. An experimental design is required to answer the question of causality.

Questions were asked regarding device certification. The first question asked for the method of certification for a school's FTD. Twenty-six schools reported that their device was approved by a letter of authorization issued after August 1, 1996, 16 indicted their device was approved under the conferred status provision of the guidelines, 7 indicated that they were not sure how their device was certified, and 4 indicated that their device was certified by other means, such as approved in their training course outline or other specific letters of authorization. When asked if they understand the certification requirements and regulations for their FTD, 26 answered they have a complete understanding, 30 answered they have some understanding, and 4 indicated they do not have much understanding. None answered that they have no understanding. When asked if they understand the requirements for continuing use of their FTD, 28 answered that they have a complete understanding, 28 answered that they have some understanding, and 3 answered that they do not have much understanding. No one answered that they had no understanding. When asked if their local Flight Standards District Office (FSDO) was helpful in the approval process for their FTD, 31 answered "very helpful" and 18 answered that they were "somewhat helpful". No one answered that his or her FSDO was not very helpful or were of no help at all.

The data regarding which tasks are taught in each type of device for the four targeted courses is quite lengthy and complex. The data was compiled and displayed in a total of 96 graphs. Each graph depicted the number of students that could have been taught this task. The way in which this number was derived was to add a school's enrollment figure for that

course if that school indicated they taught that task in a device. The resulting graphs depicted the number of students by course for each of the tasks listed in the 15 AOOs. A similar method was done to interpret the data about the different learning domains targeted in each device. This data may be more suspect, but does give an indication of the intent of the school. The reason this method of interpreting the data waschosen was to try to offset the fact that some schools have larger enrollments whereas others have only a few students at a time. This seems to give a more meaningful picture than simply the number of schools. Because there is no easy way to condense these graphs for the purposes of this paper, a review of the findings will be given discussing the major findings.

DISCUSSION

With respect to which tasks are being taught in FTDs, the majority seems to be in the area of instrument training. In almost all of the Areas of Operation, instrument students show the highest use in most tasks. This can be expected as most of these devices were designed for instrument training. However, it is interesting to see the number of tasks being taught at the private pilot level. Slow Flight and Stalls is an example of an Area of Operation where private students outnumber students in all other courses. The task Steep Turns, in the Performance Maneuvers Area of Operation is another. In the Ground Reference Maneuvers Area of Operation, there is some indication of use for private pilot training and, to a much lesser degree, in commercial pilot training. Whether or not the increasing number of high quality visual displays that are on newer FTDs, is contributing to this is not known. But it is likely that as newer FTDs with better visual displays are used, training in visual flight maneuvers is likely to increase. This is a potential area for further research, such as is currently ongoing in several places regarding instrument training. FTDs do not appear to be used as much in commercial and multiengine training as they are in private and instrument training, with the exception of those tasks specific to multiengine training.

Looking at the data on KSAs taught in FTDs, there seems to be more emphasis on skills than on knowledge, and very little emphasis on attitudes or decision-making. It is possible that these devices may be unsuitable for attitude or decision-making training or that this area is overlooked or misunderstood by instructors. Since the focus of most training is on the accumulation of knowledge and the development of skills, it may be assumed that decision-making is simply part of those skills and is not looked upon as a separate issue. Airline training in the past decade has evolved to include decision-making and resource management as an integral part of their programs. While it is true that airline training is different from general aviation certification training, it might be worth exploring whether or not some concepts or techniques from airline training can be applied to general aviation.

The use of PCATDs tends to mirror FTD use in most of the Areas of Operation. However, there are some notable exceptions. Takeoffs, Landings, and Go-Arounds is one such Area of Operation. While the total number of students using these devices for this training is rather small, the number of private students is significantly higher than for students training for other ratings or certificates. There is even a small number of students who train the task Rectangular Courses in PCATDs. While this may seem meaningless on the surface, apparently at least one school believes that this training may be of some value. There are even a small number of students who train for multiengine tasks in PCATDs. In the teaching of KSAs in PCATDs, the data show similar trends as with FTD use, with the exception that in some instrument tasks, skills seemed to be emphasized more than knowledge.

Training aids show very little use in most Areas of Operations, with most of that use focusing on knowledge. The data show that some flight schools use these devices, however, so there may be some real value in their use. One factor that may be limiting the use of these devices by schools is the fact that time in such devices cannot be used toward certification. It is not currently known how much students use programs such as Microsoft’s Flight Simulator

on their own and whether or not this contributes to success in training.

In summary, the data show that use of training devices are mostly in the instrument and private pilot training programs with emphasis on areas that involve airplane systems and procedures, and in instrument flying tasks. Some use is indicated in other tasks but to a much lesser degree. However, the fact that instructors are training students in tasks that are outside tasks related to instrument flying warrants attention and further investigation.

CONCLUSIONS

Many schools, especially those in university-environments and FAA approved schools appear to be using both FTDs and PCATDs a significant amount. Part 61 schools do not seem to use these devices as much. This could because of costs. The data suggests that training devices are used primarily in instrument training, but certainly not limited to that course. The data cannot address the question of whether or not the use of these devices reduces overall flight training time significantly, even though the previously cited research suggests that it can. There appears to be some confusion about training device certification, both for initial certification and continuing use. Most schools felt their FSDO was helpful with the certification of their devices. The data suggests that some schools and/or instructors are experimenting with ways to gain more training value from these devices in courses other than instrument training.

It might be helpful if some simple guidelines for device certification could be developed and distributed to all flight schools. Further controlled experiments are needed to address the question of whether or not flight training hours and thereby costs, can be reduced by the use of FTDs and PCATDs.

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