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The Effectiveness of a Personal Computer Aviation Training Device, a Flight Training Device, and an Airplane in Conducting Instrument Proficiency Checks

Volume 1: Subjective Pilot Performance Evaluation

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Foreword

This study was prompted by the FAA Advisory Circular (AC) No. 61-126 (1997), which authorized the use of a Personal Computer Aviation Training Device (PCATD) to be used for 10 of the 15 hours authorized for an approved ground training device. The advisory circular, however, did not authorize the use of PCATDs for Instrument Proficiency Checks (IPCs). The study was supported under Federal Aviation Administration (FAA) cooperative agreement DFTA2001-G-037 with the Institute of Aviation, University of Illinois at Urbana-Champaign, during September 2001-November 2004. The study was sponsored by FAA Headquarters Flight Standards Service, General Aviation and Commercial Division. Dennis B. Beringer, Civil Aerospace Medical Institute (CAMI), served as the contracting officer's technical representative for FAA-CAMI and provided editorial assistance in preparation of the final report. This report is Volume 1 of a two volume final report and is in the process of review and approval and is not at present an official FAA document. Consequently, the views expressed herein do not necessarily represent official FAA positions. Volume 2 will cover results obtained from objective pilot performance measures employed in the project. Semi-annual, annual, and published reports and presentations of the work including reports of the airborne flight data recorder (FDR) and development of objective pilot performance measures are listed in Appendix A.

We express our appreciation to Mary Wilson, who scheduled participants, and to Karen Ayers, who assisted with report formatting. We also thank Bill Jones, David Boyd, Sybil Phillips and Donald Talleur, who served as the check pilots. We also thank the Institute of Aviation flight instructors who provided familiarization training in the Flight Training Device, the PCATD, and the airplane, as well as the instrument pilots for their participation in the study.

Executive Summary

Instrument pilots must meet the recent instrument experience requirements of FAR 61.57(c) or (d) every six months to maintain instrument currency, and an approved flight-training device (FTD) or an airplane may be used to meet these requirements. An instrument pilot who fails to meet these requirements within a 12-month period must pass an instrument proficiency check (IPC) to regain instrument currency. The present study was designed to examine how FTDs and PCATDs compared with each other and with an airplane in the administration of an IPC. Two checks were performed, the first in one of the three possible devices (FTD, PCATD, airplane) and the second in an airplane. Two questions were addressed by this research: first, was the present rule allowing an FTD to be used to administer the IPC warranted and second, could a PCATD be used as effectively as an FTD to administer the check? Additionally, a test-retest paradigm using the airplane for both checks was instituted to examine the reliability of IPCs that were conducted in the criterion device; the airplane.

The study involved 75 instrument-pilot participants (25 participants in each group: FTD, PCATD and airplane). The participants were in one of four categories of instrument currency: (1) instrument current, (2) within one year of currency, (3) between one and two years of currency, and (4) between 2 and 5 years of currency and they were balanced among the three groups. Pilots in the 2 to 5 year category received up to five hours of instrument proficiency training in either a FTD or a PCATD prior to the experiment. Each flew a familiarization flight in the FTD, PCATD and the airplane (Beechcraft Sundowner) prior to being randomly assigned to one of the three groups (FTD, PCATD, and airplane). They then took a baseline instrument proficiency check (IPC #1) in their assigned device and agreed to refrain from any instrument flight, real or simulated, until after the second check (IPC #2) was conducted in the airplane. Maneuvers and completion standards were taken directly from the Instrument Rating Practical Test Standards.

Analyses were performed to evaluate differences between groups by (1) pass/fail rates, (2) maneuver performance, and (3) maneuver element performance. No significant differences in performance were found between IPCs given in a PCATD, an FTD or an airplane. Further analysis was performed to determine if performance on IPC #1 would be a good predictor of performance on IPC#2. The results indicated that the prediction was no better than chance. While the change in performance between IPC #1 and IPC #2 for all participants was statistically significant, none of the comparisons between experimental groups were. Additionally, the improvement and deterioration ratios between IPC #1 and PIC #2 were very similar for the three groups.

In contrast to this finding was the troubling result that of the 75 participants, 51 (68%) failed the first IPC. If we further restrict this to those who were instrument current (53), then 34 (64%) failed the first IPC, whereas only 23 (43%) failed the second IPC (consistent with the findings of Taylor et al., 2001).

These findings, taken together, suggest that (1) conducting IPCs in a PCATD appears to be no less effective than conducting them in a FTD or an airplane and (2) “instrument currency” may not guarantee “instrument proficiency” under the present requirements and a reevaluation of these standards may be in order given the high failure rates (>60%) found for pilots who were technically instrument current.

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1. Introduction

1.1. Background

During the past ten years there has been an increased emphasis on the use of personal computers in flight training (Campbell, 1998; Miller, 1996; Kolano, 1997). Williams (1994) summarized the findings of a joint industry-FAA conference concerned with the development and use of personal computers, which documented this emphasis. Koonce and Bramble (1998) provided an overview of the use of personal computer-based flight training devices (PCATDs). Today the personal computer is a viable tool for presenting realistic, high-quality, full-size graphic representations of aircraft instrument displays. Current technology can also provide aerodynamic models and realistic flight controls that closely mimic those experienced in flight and are as accurate as FAA approved flight training devices (FTDs). It should be noted that PCATDs also accept control inputs from low-fidelity devices that range from computer keyboards, single joysticks, and yoke/pedal combinations of varying quality (Peterson, 1993). PCATDs also have navigation databases, which provide unlimited geographic coverage. However, while PCATDs provide many features required to practice instrument tasks, their fidelity may be low in areas such as displays, switches, out-of-cockpit scenes, control loading and flight dynamics, which are usually thought to be important in instrument training. Nevertheless, and most importantly, PCATDs offer a low-cost alternative for instruction of instrument tasks at a cost of less $6,000.

Empirical evaluations by Phillips, Hulin and Lamermayer (1993), Ortiz (1994) and Dennis (1994) have found positive transfer of training from personal computers to the airplane, but these studies have been limited in dealing primarily with individual instrument tasks. A report by Hampton, Moroney, Kirton, and Biers (1994) reported that students trained in a PCATD performed as well on instrument procedures in the airplane as students trained in a Frasca 141 FTD. No airplane control group was used in this study, and so it was not possible to determine the transfer effectiveness of the PCATD or the Frasca 141. Karp (2001) recently described the use of PCATDs in the classroom. He found that the use of PCATDs in the classroom was effective but the PCATD was not used to substitute for flight time in the airplane.

1.2. Transfer of Training Studies

Taylor, Lintern, Hulin, Talleur, Emanuel, and Phillips (1996, 1999) and Taylor, Talleur, Phillips, Emanuel, and Hulin (1998) investigated the effectiveness of using a PCATD to develop instrument skills taught in instrument flight training and to determine the extent that these skills transfer to the aircraft. A commercially available PCATD was used to teach instrument tasks to students at the Institute of Aviation of the University of Illinois. To evaluate transfer of training, the performance of a group of participants trained in a PCATD and later trained to criterion in an airplane (PCATD group) was compared to the performance of a control group of participants trained only in the airplane (Airplane group). All new maneuvers and procedures for the PCATD group were introduced and trained to proficiency in a PCATD prior to training and skill validation in the airplane. All new maneuvers for the Airplane group were introduced and trained to proficiency in the airplane. The dependent variables were the number of trials to criterion in the airplane for the two groups, time to complete each flight lesson in the airplane, and course completion times. The results indicated that the PCATD was an effective training device for teaching instrument tasks. Transfer savings were generally positive and statistically significant when new tasks were introduced, but lower transfer was found when reviewing previously learned instrument tasks. An evaluation of course completion times showed a saving, which was statistically significant, of about four hours in the airplane for the PCATD group compared to the Airplane group. The transfer effectiveness ratio (TER) was 0.15 or a savings of 1.5 flight hours for each ten hours of PCATD time. The low overall TER was due to the methodology of including the review of instrument tasks previously trained to proficiency in the overall TER.

Williams and Blanchard (1995) discussed the development of qualification guidelines for PCATDs. As result of the Taylor et al. (1996) study, the Federal Aviation Administration (FAA) published an advisory circular concerned with the qualification and approval of PCATDs (U.S. Department of Transportation, 1997). The advisory circular permitted the use of PCATDs in instrument training programs conducted under FAR Part 61 and FAR Part 141 and authorized the substitution of a PCATD for 10 of the 15 hours authorized for an approved ground training device. The advisory circular did not authorize the use of PCATDs for instrument proficiency checks (practical tests) nor for instrument recent-flight-experience requirements.

In a follow-on study concerning incremental transfer of training effectiveness Taylor, Talleur, Emanuel, Rantanen, Bradshaw, and Phillips (2001) found that the PCATD was effective in teaching basic instrument tasks to private pilots. Prior training in the PCATD for 5, 10, or 15 hours resulted in a smaller number of trials in the airplane for each of the three PCATD groups when compared to the Airplane group which was trained only in the airplane. However, the transfer effectiveness ratio was not a simple function of the amount of practice in the PCATD. Although it seems reasonable to believe that greater training in the PCATD would reduce the amount of training needed in the aircraft, this prediction was not borne out. For five of the eight instrument tasks, the PCATD 10-hour group needed the fewest number of trials in the airplane, for two tasks the PCATD 5-hour group had the fewest number of trials in the airplane and the PCATD 15-hour group had one task with the fewest number of trials in the airplane. Of course, all groups benefited to some extent from their practice. The mean times to complete the flight lesson in the airplane for the four flight lessons in which there was prior training in the PCATD were less for all three PCATD groups than for the Airplane group.

1.3. Recency of Experience Studies

A study by Taylor, Talleur, Bradshaw, Emanuel, Rantanen, Hulin and Lendrum (2001) and Talleur, Taylor, Emanuel, Rantanen, & Bradshaw (2003) determined the effectiveness of PCATDs for maintaining instrument currency. One hundred six instrument current pilots were divided into four groups: a PCATD group, a FTD group, an airplane group, and a control group. The pilots in each group received an initial instrument proficiency check (IPC #1). During a six-month period following IPC #1, the pilots in three groups received recurrent training in a PCATD, a Frasca FTD, or an airplane, respectively. The fourth (control) group received no training during the six-month period. After this time, the pilots in each group flew an instrument proficiency check (IPC #2). The comparison of IPC #1 and IPC #2 indicated that both the PCATD and the Frasca FTD were more effective in maintaining instrument proficiency when compared to the control group and at least as effective as the airplane. The study also found that of 106 instrument-current pilots, only 45 (42.5%) were able to pass IPC #1. Of the group who received an IPC in a Frasca FTD to regain currency, only 22 of 59 (37.3%) were subsequently able to pass IPC #1 in an airplane. This study established the effectiveness of PCATDs for use in instrument currency training. However, the question of whether PCATDs are effective for administering the IPC was not demonstrated in this project. Based on the data above, a question concerning the effectiveness of the Frasca FTD in administrating an IPC also arose.

1.4. Purpose of the Study

Although the PCATDs have been shown to be effective in training basic instrument flight skills as well as in maintenance of these skills to meet recency of experience requirements, a critical element, using PCATDs to administer an IPC flight has been conspicuously missing from the research literature. The purpose of the present study was to compare the performance of pilots receiving an IPC (IPC #1) in a PCATD, a FTD or an airplane with their performance in an airplane (IPC #2). Currently, the PCATD is not approved to administer IPCs. The comparison of performance in a FTD with performance in an airplane was to determine whether the current rule to permit IPCs in a FTD is warranted. Finally, the comparison of performance of pilots receiving IPC #1 in an airplane and IPC #2 in an airplane with a second CFII will permit the determination of the reliability of IPCs conducted in an airplane and in accordance with current IPC requirements.

2. Method

2.1. Participants

One hundred and five participants were originally approved for the project. Due to funding constraints the total number of pilots participating in the experiment was reduced to 75 (25 per group). All participants were instrument pilots, but not all were instrument current when they began the experiment. The participants agreed to refrain from instrument flight for the duration of the study (about 2 weeks). They also agreed not to use a PCATD for instrument training during this period. Volunteer participants were recruited within a 75-mile radius of Champaign, IL. Their participation was solicited using a mail survey, which was sent to all instrument-rated pilots in the area. A total of 267 pilots responded with a statement of interest. Pilot Experience and Biographical Data Questionnaires (Appendix B) were mailed to the 267 instrument pilots who expressed interest. A total of 179 pilots returned the questionnaire, which collected information about the pilot's experience and instrument currency status. Of these 179 pilots, 146 were placed in the potential participant pool. Additional participants were later added to the pool. The average age of the participants was 49 years with a range of 20 to 80 years. Average total flight experience was 1909 hours with a range of 142 to 13,000 hours. Average experience in aircraft similar to the type used in the experiment was 1572 hours with a range from 140 to 11,438 hours.

The instrument pilots considered potential participants for the study were in one of four categories of instrument currency: (1) instrument current, (2) within one year of currency, (3) between one and two years of currency, and (4) between 2 and 5 years of currency. Pilots in the 2 to 5 year category received up to five hours of proficiency training in either a FTD or a PCATD prior to the experiment (see Appendix C). The device used for this proficiency training was balanced across participants. Several potential participants failed to reach proficiency (a level of performance indicating they should be able to pass an IPC in the aircraft) and were subsequently released from the project prior to their involvement in the experiment. No additional participants in the 2-5 year category were included in the study after the number of participants in the study was reduced to 75. All participants had the option of receiving payment for flight time flown during the experiment, as well as mileage costs to and from Willard Airport in Savoy, IL, where all sessions took place.

2.2. Apparatus

Two FAA approved Elite PCATDs with a Piper Archer performance model and two FAA approved Frasca 141 FTDs with a generic single-engine, fixed-gear, fixed-pitch propeller performance model were used. The FTDs were approved for instrument training towards the instrument rating, instrument recency of experience training, and instrument proficiency checks (IPCs), as well as for administering part of the instrument rating flight test. Two single engine 180 hp Beechcraft Sundowner aircraft (BE-C23) with fixed-pitch propellers and fixed undercarriage were used as the testing aircraft for IPC #1 and IPC #2. An airborne flight data recorder (FDR) was installed in each aircraft to record flight data during the IPC flights (Lendrum, Taylor, Talleur, Hulin, Bradshaw, & Emanuel, 1999, 2000).

2.3. Procedure

Each participant received a Visual Flight Rules (VFR) familiarization flight in the FTD, the PCATD and the airplane prior to being assigned to an experimental group (see Appendix D). The participants also received a review of the aircraft systems and instrumentation in each device. The order in which each participant received their familiarization flights was randomized with a constraint that each experimental group had a balance of the participants receiving each of the six possible familiarization orders. Following the familiarization flights, participants were randomly assigned to one of the three groups (FTD, PCATD and airplane) with a constraint that the four currency categories and familiarization orders were balanced among the groups.

All pilots began the experiment with a baseline instrument proficiency check (IPC #1) in either an Elite PCATD, a Frasca FTD or a Beechcraft Sundowner airplane, according to which group they were assigned. IPC #1 was flown with a certified flight instructor, instruments (CFII), who acted both as a flight instructor and as an experimental observer. The IPC is a standardized test of the instrument pilot's instrument skills. The types of maneuvers, as well as completion standards for an IPC, are listed in the instrument rating practical test standards (PTS) (U.S. Department of Transportation, 1999). A flight scenario, that follows the current guidelines for the flight maneuvers required by the PTS, was used for the IPC. This scenario was used to collect baseline data and to establish the initial level of proficiency for each participant who participated in the project. Table 1 shows the experimental design.

Table 1. *Experimental Design*

GROUP	Fam. Flight	Initial IPC flight (IPC#1)	Final IPC flight (IPC#2)
Airplane	In Sundowner, Frasca and Elite	In Sundowner	In Sundowner
FTD	In Sundowner, Frasca and Elite	In Frasca	In Sundowner
PCATD	In Sundowner, Frasca and Elite	In Elite	In Sundowner

The IPC #1 flight contained seven maneuvers (VOR approach, holding pattern, steep turns, unusual altitude recovery, ILS approach, VOR partial panel approach and ATC procedures and communication). The CFIIs for the IPC #1 flight used a form that was designed to facilitate the collection of three types of data (Phillips, Taylor, Lintern, Hulin, Emanuel, & Talleur, 1995) (see Appendix E). First, within each maneuver there were up to 24 variables (e.g., altitude, airspeed) which were scored as pass/fail indicating whether performance on those variables met PTS requirements. Second, the flight instructor judged whether the overall performance of the each maneuver was pass/fail. Third, the CFII recorded if the overall performance of the participant met the PTS for the IPC.

3. Results

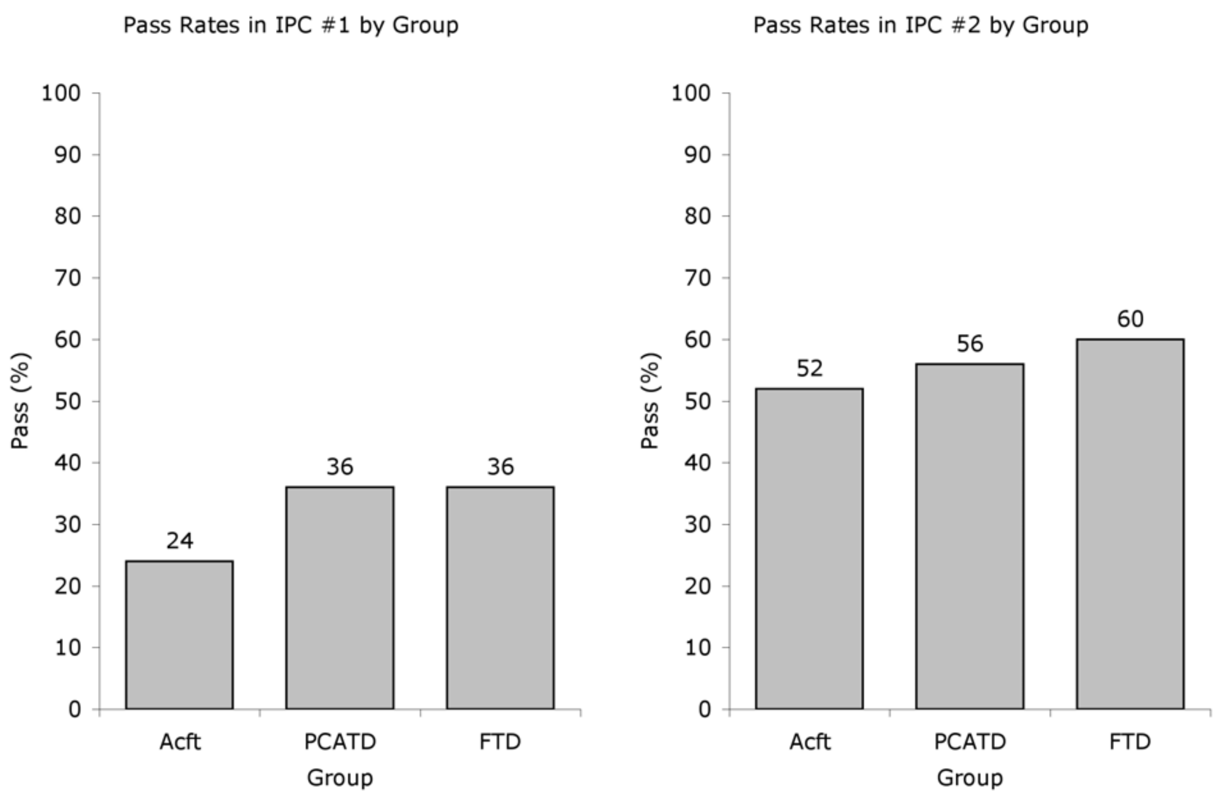
As indicated above, three types of data were collected. The primary data presented first concerns the pass/fail rate on IPC #1 and 2 by the experimental group, which permitted a comparison of the effectiveness of the PCATD and FTD with the airplane. The next level of analysis evaluated the performance of the three groups at the maneuver level for IPC #1 and 2. The third level of analysis was concerned with the elements in each maneuver. Demographic variables were analyzed to determine if they had any effect on the experimental outcome. Finally the inter-rater reliability of the check pilots was analyzed to rule out any contamination of the data by CFII performance.

3.1. IPC #1 and IPC# 2 Pass/Fail Rate by Group

Table 2 presents the number and percentage of pilots that passed/failed IPC #1 and IPC #2 for each of the three experimental groups and for the total participants. Figures 1 and 2 shows the differences between pass rates for the three groups for IPC #1 and IPC #2, respectively. Inspection of Figures 1 and 2 indicate few differences between groups for the number of participants who passed IPC #1 and IPC #2. A total of 24 of 75 participants (32%) passed the IPC #1 and a total of 42 of 75 participants (56%) passed the IPC #2 flight across all three experimental groups. Chi-square tests were used to analyze the IPC #1 and IPC #2 data to determine whether the treatment (assignment to group) had an effect on the pass/fail ratio for the IPC #1 and IPC #2 flights respectively. The treatment effect on the IPC #1 pass/fail ratios was not statistically significant, χ^2 (2, N=75) = 0.32, p = 0.85. Neither was the treatment effect statistically significant for the IPC #2 pass/fail ratio, χ^2 (2, N=75) = 1.1, p = 0.58.

Table 2. *Pass/Fail rates for each experimental group*

		IPC#1				IPC#2			
Group	N	Pass	(%)	Fail	(%)	Pass	(%)	Fail	(%)
Aircraft	25	6	(24)	19	(76)	13	(52)	12	(48)
FTD	25	9	(36)	16	(64)	14	(56)	11	(44)
PCATD	25	9	(36)	16	(64)	15	(60)	10	(40)
Total	75	24	(32)	51	(68)	42	(56)	33	(44)



Figures 1 and 2. Pass rates in IPC #1 and IPC #2 by experimental group.

A series of planned pairwise comparison tests were performed between and among the experimental groups. The first comparison evaluated the performance of the PCATD group on IPC #2 with the Aircraft group; the difference between these groups was not significant, χ^2 (2, N = 50) = .32, $p > .10$. The next comparison evaluated the performance of the PCATD group on IPC #2 with the FTD Group but yielded no significant difference, either, χ^2 (2, N = 50) = 0.08, $p > .10$. The final comparison evaluated the performance of the Aircraft group on IPC #2 with the Frasca group and showed a non-significant difference between the groups , χ^2 (2, N = 50) = 0.08, $p > .10$.

3.2. Performance of Changes from IPC #1 to IPC #2

Analysis of the change of performance that took place between the IPC #1 and IPC #2 flights was made in order to understand the effectiveness of the three devices in conducting IPCs. It was expected that performance on IPC #1 would be a good predictor of performance on IPC#2. Table 3 shows a comparison of the pass/fail rates for IPC #1 and IPC #2. Of the 24 participants who passed IPC #1 only 14 also passed IPC #2 (58%), and of the 51 participants who failed IPC #1 only 23 (45%) subsequently failed IPC #2 (a total of 37). Twenty-eight participants, who failed IPC #1 subsequently passed IPC #2 and 10 of the participants who passed IPC #1 subsequently, failed IPC #2 (a total of 38). Therefore, performance on IPC #1 predicted the performance on IPC# 2 only at the chance level. Indeed, the McNemar change in performance analysis between IPC #1 and IPC #2 for all participants was significant; χ^2 (1, N = 75) = 8.53, p < .005.

Table 3. *Comparison of IPC #1 vs. IPC #2 Pass/Fail*

		IPC#2		
		Pass	Fail	Total
IPC#1	Pass	14	10	24(32)%
	Fail	28	23	51(68%)
	Total	42 (56%)	33 (44%)	75 (100%)

Table 4 shows the IPC #1 and IPC # 2 pass/fail frequencies for the aircraft group. The McNemar test for change in performance between IPC # 1 and IPC #2 (with a continuity correction applied) was not significant; χ^2 (1, N = 25) = 3.27, p > .05.

Table 4. *Aircraft Group. IPC #1 vs. IPC #2 Pass/Fail*

		IPC#2		
		Pass	Fail	Total
IPC#1	Pass	4	2	6 (24%)
	Fail	9	10	19 (76%)
	Total	13 (52%)	12 (48%)	25 (100%)

Table 5 shows the IPC #1/IPC # 2 pass/fail frequencies for the FTD group. The McNemar test for change in performance between IPC # 1 and IPC #2 was not significant; χ^2 (1, N = 25) = 1.92, p > .10.

Table 5. *FTD Group. IPC #1 vs. IPC #2 Pass/Fail*

		IPC#2		
		Pass	Fail	Total
IPC#1	Pass	5	4	9 (36%)
	Fail	9	7	16 (64%)
	Total	14 (56%)	11 (44%)	25 (100%)

Table 6 shows the IPC #1/IPC # 2 pass/fail for the PCATD group. The McNemar test for change in performance between IPC # 1 and IPC #2 was not significant; χ^2 (1, N = 25) = 2.57, p > .10.

Table 6. *PCATD Group. IPC #1 vs. IPC #2 Pass/Fail*

		IPC#2		
		Pass	Fail	Total
IPC#1	Pass	5	4	9 (36%)
	Fail	10	6	16 (64%)
	Total	15 (60%)	10 (40%)	25 (100%)

The IPC #1 and IPC #2 pass-fail frequencies by group are presented in Table 7. Analyses to determine the performance changes between IPC #1 and the IPC #2 for each experimental group were conducted and improvement and deterioration ratios are presented (Figure 3). Participants who failed IPC #1 in the aircraft, FTD, or PCATD and passed IPC #2 are included in the improvement ratio and participants who passed the IPC #1 and failed IPC #2 are included in the deterioration ratio. The improvement ratios for the three groups are very similar. The airplane and FTD groups had 36% of their participants who failed IPC #1 pass IPC#2, while the PCATD group had 40%. The airplane group had only 8% who failed IPC # 2 after passing IPC # 1 (the deterioration ratio) while both the FTD and the PCATD groups both had deteriorations ratios of 16%.

Table 7. *IPC #1 and IPC #2 pass/fail by group.*

Group	Pass IPC #1		Fail IPC #1		Total
	Pass IPC #2	Fail IPC #2	Pass IPC #2	Fail IPC #2	
Aircraft	4	2	9	10	25
FTD	5	4	10	6	25
PCATD	5	4	9	7	25
Total	14	10	28	23	75

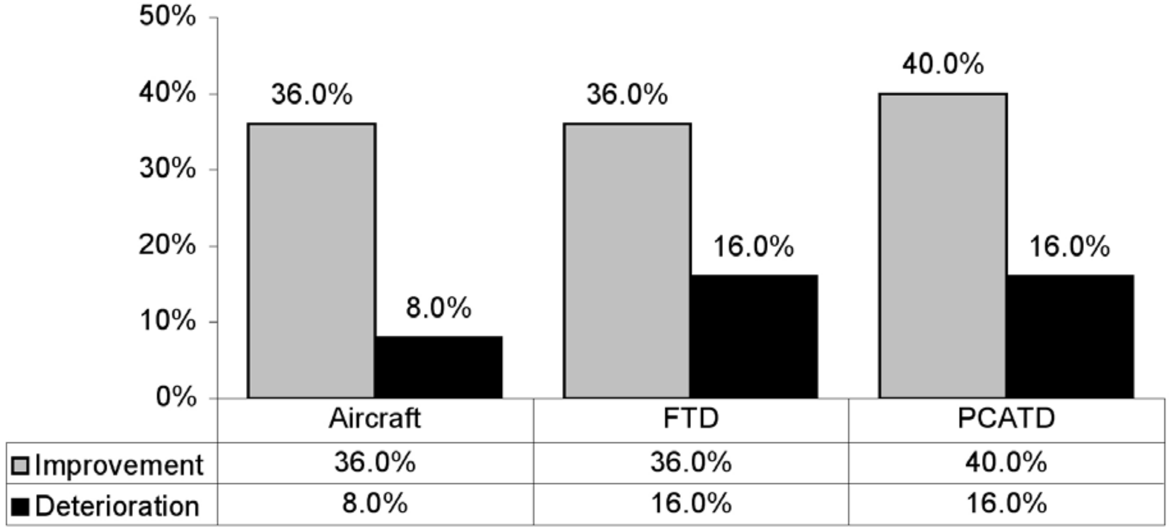


Figure 3. Skill improvement/deterioration by group

3.3. IPC #1 and IPC #2 Pass/Fail Rates by Currency Status

As indicated earlier, only a third of the instrument pilots passed IPC# 1 but over half passed IPC# 2. Table 8 illustrates the number of participants that passed/failed IPC #1 flight by prior currency status. Of the 75 participants who completed IPC #1 only 24 passed (32%) and 51 failed (68%). Of the 53 instrument current pilots, only 19 (36%) passed IPC #1 and 34 failed (64%), but 30 passed IPC # 2 (57%) in the aircraft and 23 failed (43%). The number of participants in the remaining currency groups is too small to permit meaningful analysis.

Table 8. *IPC #1 and IPC #2 pass/fail rates by currency status*

	IPC#1				IPC#2			
	Pass		Fail		Pass		Fail	
Status	N	%	N	%	N	%	N	%
Current	19	36	34	64	30	57%	23	43%
1 year	2	29	5	71	6	86%	1	14%
1-2 year	1	100	0	0	1	100%	0	0%
2-5	2	14	12	82	5	13%	9	87%
Total	24			51	42		33	

The next level of analyses, more detailed than the previous analyses, was by the maneuver, control and procedural elements, and for the individual maneuvers in the IPC flight. Each of these analyses is presented below.

3.4. Change in Maneuver Performance between IPC #1 and IPC#2

An analysis of the changes in maneuver performance that occurred between IPC #1 and IPC #2 was performed to determine if there were systematic changes in performance when considering the overall change in number of maneuvers passed. There were seven maneuvers to be scored in both IPC #1 and IPC#2. An overall “maneuver change score” (+1, 0, -1) for each maneuver was determined for each participant; a positive score represents an improvement from IPC #1 to IPC #2, while a negative score represents a loss of skill from IPC #1 to IPC #2. The maneuver change scores for the seven maneuvers were then summed for each participant. The participant’s overall performance change from IPC #1 to IPC #2 could range from –7 to 7. These scores were then standardized and analyzed using a single factor ANOVA to determine if there was a difference between experimental groups. The change in maneuver performance between IPC #1 and IPC #2 was not significant, $F(2,74) = .78$, $p > 0.10$.

3.4.1. Control and procedural element change in performance analysis

An analysis of the change in performance at the maneuver element level was performed to determine if any particular control or procedural elements contributed significantly to the overall maneuver pass/fail judgment. This analysis goes beyond the maneuver pass/fail change score analysis at the maneuver level in that it examines whether performance on certain component skills of the maneuvers in Table 9 (i.e., procedural and psychomotor skills) were influenced by experimental assignment. There were several different elements for each maneuver that received a pass/fail score for both IPC #1 and IPC#2, so it was possible to assign an overall ‘maneuver element change score’ to each participant in the same manner as described earlier. The participant received a ‘1’ or ‘0’ assignment depending on whether they passed or failed a given element within a given maneuver. Maneuver elements fell into two distinct categories: procedural and psychomotor (referred to as ‘control’). Therefore, two separate maneuver element change scores were computed. The procedural element change score consisted of those maneuver elements that were not directly related to aircraft control, but rather the execution of instrument procedures. The control element change score consisted of those maneuvers that specifically indicated how well the participant controlled the aircraft flight path and performance during flight in the process of executing the aforementioned procedures. Only four of the six flight maneuvers scored had both procedural and control maneuver elements. The remaining three maneuvers consisted of either pure procedural or pure control elements (ATC communication was not analyzed here since it has only one procedural element); the unusual attitude has only one control element; the steep turn consists of only control elements).

Four separate ANOVA were used to compare all three experimental groups for a change in performance on the VOR approaches, hold, and ILS approach on either procedural or control elements between IPC #1 and IPC #2 (each ANOVA was a 2 x 3 mixed design). None of the ANOVA showed a main effect for group assignment

Table 9. *Number of procedural/control elements on each maneuver*

Maneuver	Procedural	Control	ANOVAs	McNemar, χ^2
VOR	11	13	p > .10	
HOLD	9	11	p > .10	
Steep Turn	0	6	p > .10	
Unusual Attitude	0	1		p > .10
ILS	4	8	p > .10	
VOR, partial panel	5	8	p > .10	
ATC	1	0	NA	NA

The Unusual attitude and ATC communication contained only one control and procedural element respectively, and as such, a pass or failure on those single elements determined whether the maneuver was passed or failed. A McNemar χ^2 analysis was used to compare the performance on the unusual attitude maneuver since, due to only one element, a pass or failure could be tallied by a simple count. The analysis showed that this maneuvers' performance did not differ significantly between IPC #1 and IPC #2 for the three experimental groups. The ATC procedural maneuver did not have a sufficient number of failures in any of the three groups to warrant analysis. From these analyses, we infer that the performance changes observed between IPC #1 and IPC #2 were not related to the group assignment.

3.4.2. Change in performance between the IPC flights for individual maneuvers

Since the previous analysis considered the performance on all six maneuvers simultaneously, the pattern of maneuvers passed in IPC #1 and IPC #2 could not be determined. It was not necessary to "pass" all maneuvers in order pass IPC #1 and IPC #2. Therefore a change in the individual maneuvers passed, while leaving the total number of maneuvers passed unchanged, could easily result in a participant who had not previously passed IPC #1, passing IPC #2. Performance changes between IPC #1 and IPC #2 for each group, considering each maneuver individually, were compared. Since this analysis compares pass/fail judgments for only one maneuver within each experimental group, the appropriate analysis method was the McNemar Chi-square test for intervening activity effect. The results of this post-hoc analysis are shown in Table 10. The columns in Table 10 represent the individual maneuvers that were performed on IPC#2. ‘VOR’ is the VOR instrument approach. This maneuver requires both psychomotor skill and is also highly procedural. ‘Hold’ is the holding procedures and also requires a combination of psychomotor and procedural skill. ‘Steep T’ represents the steep turns (one to the left and one to the right) that were performed and is almost entirely dependent on psychomotor skill. ‘Uns. Att.’ is the unusual attitude recovery and is also mainly dependent on psychomotor skill. ‘ILS’ is the ILS instrument approach and requires coordination of both psychomotor and procedural skills. ‘VOR PP’ is the VOR partial panel approach and requires the same skills as the earlier VOR approach. ‘ATC’ is the participants’ performance on air traffic control (ATC) communications throughout the flight and is mainly a procedural skill. Improvement by an experimental group on a given maneuver is indicated by a (+) preceding the McNemar chi-square statistic. A (-) indicates that deterioration on that maneuver occurred. In order for an individual maneuver to show a significant change in performance between IPC #1 and IPC #2 for a given group, each McNemar statistic must be rejected against a Chi-Square critical value determined by df=1 and the desired p-value. Rejection of the null hypothesis for no improvement was made if, χ^2 (1, N=25) ≥ 3.84, after a continuity correction was applied. One result of the analysis shows that all three training groups (i.e., Aircraft, FTD or PCATD) showed a trend of improvement in performance on most of the seven maneuvers between IPC #1 and IPC#2. Several maneuvers showed a significant improvement in performance. It is note worthy that both the PCATD and Frasca groups performance deteriorated on ATC communication. Although the result was not significant after continuity correction, and indicates a possible drawback to practicing communications outside of the actual ATC environment.

Table 10. *McNemar Statistics for change in performance between IPC #1 and IPC #2for individual maneuvers; (+) indicates improvement and (–) indicates deterioration from IPC #1 to IPC#2.*

Maneuvers: Group	VOR	Hold	Steep T.	Uns Att	ILS	VOR PP	ATC
Aircraft	(+) 0.10	(+) 0.36	(-) 0.10	(+) 0.10	0.00	(+) 0.17	(+) 0.00
PCATD	(+) 0.13	(+) 2.77	(+) 0.13	(+) 2.25	(+) 3.13*	(+) 3.13*	(-) 0.00
Frasca	(+) 5.82**	(+) 2.08	(+) 0.13	(-) 1.13	(+) 0.19	(+) 3.13*	(-) 0.00

**Significant at p < .05
*Significant at p < .10

3.5. Demographic Factors

The next analyses compared the demographic factors between the three experimental groups. The results show that all demographic effects were balanced among the groups and hence did not influence any of the between-groups results (see Table 11).

Table 11. *Between participants/within group ANOVA results of demographic factors.*

Factor	F	p
Prior Currency	0.00	1.00
Age	0.27	0.76
Flight Time	0.65	0.52
Recent Exp.	0.13	0.88

3.6. Inter-Rater Reliability

Three analyses were performed to (1) determine that all 4 check pilots were assigned to equal proportions of IPC #1 and IPC #2 flights between experimental groups, (2) examine the extent of agreement on the check pilots' ratings on the same participant, and (3) assess overall interrater reliability.

A Friedman test for *j* matched groups was completed to determine if the IPC check pilots had given a proportionally equal number of IPC #1 and IPC #2 sessions within each experimental group. Rankings were established for each check pilot (see Table 12). No significant differences were found, χ^2 (2, N = 12) = .375, $p > .10$, and χ^2 (2, N = 12) = .5, $p > .10$ respectively for IPC #1 and IPC #2, indicating that any variability introduced by an individual check pilot was evenly distributed across the three experimental groups.

Table 12. *Inter-rater reliability*

	IPC#1						IPC#2					
IP	A	A-Rank	P	P-Rank	F	F-Rank	A	A-Rank	P	P-Rank	F	F-Rank
1	8	3	5	2	4	1	5	2	4	1	14	3
2	3	1	9	3	7	2	11	3	10	2	3	1
3	5	3	3	1.5	3	1.5	3	2	1	1	4	3
4	9	2	8	1	11	3	6	2	10	3	4	1
	Tj	9		7.5		7.5	Tj	9		7		8

Since each participant received IPC #1 and IPC #2 by two different check pilots, it was important to rule out any possible bias effect from a particular paring of check pilots. In doing so, all possible pairings of the four check pilots within participants for IPC #1 and IPC #2 were compared (see Table 13). An IP pairing is represented in Table 13 using the lastname initial of each checkpilot who scored a participants IPC#1 and IPC#2 respectively.

Table 13. *Paired inter-rater analysis of all possible pairings of check pilots and ratings on IPC #1 and 2; Agree = both pass or fail, Disagree = change in IPC score. IP Pairs are grouped using the 4 check pilot's lastname initials (B, J, P, and T)*

	Observed			Expected	
IP Pair	Agree	Disagree	Totals	Agree	Disagree
BJ/JB	9	11	20	9.87	10.13
BP/PB	4	1	5	2.47	2.53
BT/TB	9	7	16	7.89	8.11
JP/PJ	1	1	2	0.98	1.01
JT/TJ	9	12	21	10.36	10.64
PT/TP	5	6	11	5.43	5.57
Totals	37	38	75		

No association between agreements/disagreements and any check pilot pairings, χ^2 (5, N = 75) = 2.76, $p > .10$, was found indicating that no one particular pairing of check pilots scored IPC performance significantly different than any other pairing.

In conventional test-retest situations, it is customary to calculate the inter-rater reliability for all raters (e.g. check pilots) who administer the same test. In this project, a single inter-rater score for all four check pilots would not take into account that the same check pilot never gave the same participant the IPC test twice. Under these circumstances, it is appropriate to consider each check pilot's inter-rater reliability across participants to whom they administered the IPC, since each check pilot gave a proportionally equal number of IPC sessions to each experimental group and to each currency level. A z-test was then performed on the group of four inter-rater reliability scores and no significant difference was found (see Table14).

Table 14. *Inter-rater Agreement (number of Agreements/number of IPCs given)*

IP	Agreement	
1	0.55	
1	0.44	Mean =0.50
3	0.53	SD = 0.05
4	0.48	Z-test p-value = .66

Although no significant difference between check pilot inter-rater reliability was found, this analysis may be confounded by a change in participant performance as a result of group assignment. However, it would be unlikely, considering the lack of differences in performance between experimental groups, that participant performance has significantly affected the inter-rater reliability.

After all experimental sessions were complete, a short questionnaire was administered to the four IPC checkpilots to capture their opinions on the use of the aircraft, PCATD and FTD for administering IPCs (see Appendices F and G). Responses to the questions varied widely, making any meaningful analysis difficult. However, one point on which all checkpilots agreed was that all favored the use of an aircraft over either an FTD or PCATD for giving IPCs, regardless of prior knowledge about the particular IPC applicant. Also, in one open-ended question, 3 of the 4 checkpilots cited control fidelity issues as a hindrance to effectively administering IPCs in the ground training devices.

4. Discussion

This study has demonstrated that there are no significant differences in performance by instrument pilots on an IPC given in either a PCATD, an FTD or an airplane. No significant difference was found on IPC #1 among the three groups, which indicates that the participants performed the same regardless of the device in which they had the IPC. In addition there was no significant difference on IPC #2 indicating that the device in which the participants had IPC #1 had no influence on their performance on IPC #2 in the airplane. The planned comparisons showed that performance on IPC #2 of the PCATD group was statistically indistinguishable from both the airplane and the FTD groups. In addition, there was no difference in performance between the aircraft and the FTD groups. These findings present compelling evidence that the FAA should permit the use of PCATDs to give IPCs.

It was expected that performance on IPC #1 would be a good predictor of performance on IPC#2. A comparison of the pass/fail rates for IPC #1 and IPC #2 indicated that the performance on the baseline IPC was not a good predictor of performance on the final IPC. Only 58 percent of the participants who passed IPC #1 also passed IPC #2 and only 45 percent of the participants who failed IPC #1 also failed IPC #2. Only 49 percent of the participants either passed both tests or failed both tests, while 51 percent of the participants passed IPC #1 and failed IPC #2 or failed IPC #1 and passed IPC #2. Therefore performance on IPC #1 predicts performance on a second IPC at a chance level.

The McNemar change in performance between IPC #1 and IPC #2 for all participants was significant but the comparisons for the individual three groups were not significant. Some of the failures may be related to a lack of familiarity with the PCATD, the FTD and the Sundowner airplane, since few of the participants had flown either of the devices or the aircraft prior to the study. The familiarization flights in each of the devices were expected to provide sufficient familiarity with the devices to eliminate the problem but apparently failed to do so. It is possible that additional familiarity with instrument flying in each device, in addition to the VFR familiarization, was needed. The former was not done in order to minimize a possible training effect on group assignment.

Since there was a large change in performance between IPC #1 and IPC #2 for each of the groups, improvement and deterioration were computed for each group. The improvement and deterioration ratios for the three groups are very similar. Tests of significance indicated that for all three groups, the performance was no more likely to improve than to deteriorate.

Of the 53 participants who were instrument current, only 19 (36 %) passed IPC #1. The earlier studies by Taylor et al. (2001) and Talleur et al. (2003) showed that 42 % of the instrument current pilots passed the initial IPC. The results from the current study are only slightly worse in this regard than those from earlier studies. In addition, most of the participants tested in the previous study had not taken an IPC after the test was standardized to include required maneuvers (thereby increasing the difficulty of the IPC test). This finding raises questions concerning the relationship between instrument currency and instrument proficiency. Less than half of the participants were able to demonstrate instrument proficiency in an IPC in the airplane. This suggests the need for the FAA to consider changing the recency of experience requirements for instrument currency. Taylor et al. (2001) made the same observation and the current study reinforces the concern that currency rules are inadequate for instrument pilots to maintain proficiency. As Taylor et al. (2001) suggested, an alternative approach would be to require a periodic IPC to demonstrate instrument proficiency in addition to the present currency requirements.

Analysis of the change in maneuver performance between IPC #1 and IPC #2 showed no significant differences between groups. In the study by Taylor et al. (2001) individual maneuvers performed during IPC #2 showed that the PCATD was more effective than either the Aircraft or the FTD in terms of the number of maneuvers that were scored as passes by the check pilot. One possible explanation for the result in the current study is that all participants were not instrument current prior to IPC #1 as was the case in the previous project.

The effectiveness of the PCATD for training specific maneuver elements (i.e., altitude control, airspeed control, navigation procedures, etc.) was observed by comparing performance on subsets of maneuver elements between the experimental groups. None of the group comparisons on procedural/control element change in performance were significant. The study by Taylor at al (2001) showed a significant improvement for the FTD group on procedural elements on the hold relative to the Aircraft and Control groups, which is similar to the findings of Homan and Williams (1997) as well as Taylor and Stokes (1986), and Taylor (1985). The PCATD group showed a significant improvement on control elements for the ILS approach. This result appears to contradict the finding by Dennis and Harris (1998) that inferred that the PCATD was not effective for practicing psychomotor skills. However, it is well accepted that instrument flight tasks may require differing levels of psychomotor skills than the visual tasks such as those examined by Dennis and Harris (1998). The current study's finding is not unexpected, however. In Taylor et al. (2001), recent experience requirements were met using the PCATD and FTD (according to group assignment) as a means of maintaining instrument currency. This extra exposure to instrument practice in ground training devices accounted for the observed change in performance. Since the current project participants had no such practice in the PCATD, or FTD, significant improvements in maneuver element performance were not expected.

The effect of pilot experience as an explanation for observed variability in data has been reviewed by Taylor (1985) and Taylor and Stokes (1986). The participants in the present study had a wide range of piloting experience which could potentially affect piloting performance. A biographical questionnaire was completed on each participant so that demographic data could be incorporated into the analysis. No significant differences for any demographic factors between groups were found; thus we conclude that the effect of pilot experience was balanced across all groups.

5. Recommendations for Rulemaking

Based on the findings of the study reported here, two specific recommendations for future rulemaking can be made:

1. We recommend that the FAA permit the use of approved PCATD to give Instrument Proficiency Checks.
2. We recommend that the FAA consider changing recency of experience requirements for instrument currency. This recommendation was also made by Taylor et al. (2001).

6. Summary and Conclusions

This study has demonstrated that PCATDs are no less effective than either the airplane or the FTD in conducting Instrument Proficiency Checks. The results indicated no significant differences in performance by instrument pilots on an IPC given in either a PCATD, and FTD or an airplane. Performance on the IPC of the PCATD group was statistically indistinguishable from both the airplane and the FTD groups. In addition, there was no difference in performance between the aircraft and the FTD groups. These findings present evidence that the FAA should permit the use of PCATDs to give IPCs.

It was expected that performance on IPC #1 would be a good predictor of performance on IPC #2. A comparison of the pass/fail rates for IPC #1 and IPC #2 indicated that the performance on the baseline IPC was not a good predictor of performance on the final IPC. The results indicated that the prediction was no better than chance; only 58% percent of the participants who passed IPC #1 also passed IPC #2 and 45% percent of the participants who failed IPC #1 also failed IPC #2

The change in performance between IPC #1 and IPC #2 for all participants was statistically significant, but none of the comparisons of groups were significant. Analyses to determine the performance changes between IPC #1 and the IPC #2 for each experimental group were conducted and improvement and deterioration ratios were calculated. The improvement and deterioration ratios for the three groups were very similar. These results are comparable to those of an earlier study by Taylor, Talleur, Bradshaw, Emanuel, Rantanen, Hulin and Lendrum (2001).

This finding raises questions concerning the relationship between instrument currency and instrument proficiency. Of the participants who were instrument current, less than half of the participant population was able to demonstrate instrument proficiency in an IPC in the airplane. This suggests the need for the FAA to consider changing the recent experience requirements for instrument currency. Alternative approaches would include requiring a periodic IPC to demonstrate instrument proficiency in addition to the current currency requirements, and/or tailoring the IPC content, or recent experience requirements to the type of flight activities the pilot engages in regularly. For example, a pilot who does not regularly fly on instruments may have to show instrument competency more often than pilots who fly in IMC regularly.

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APPENDIX A: REPORTS AND PRESENTATIONS

Semi-Annual and Annual Reports

Taylor, H L, Talleur, D A, Rantanen, E M, Emanuel, T W Jr., (2002). Comparison of the effectiveness of a Personal Computer Aviation Device, a flight training device, and an airplane in conducting instrument proficiency checks. Semi-annual report. April 10, 2002.

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Emanuel, T W Jr., Taylor, H L, Talleur, D A, Rantanen, E M. (2003). Comparison of the effectiveness of a Personal Computer Aviation Training Device, a flight training device and an airplane in conducting an instrument proficiency check. Proceedings of the 12th International Symposium on Aviation Psychology, 356-360. April 12-17, 2003, Dayton, OH.

Taylor, H L, Emanuel, T W Jr., Talleur, D A, Rantanen, E M. (2003). The effectiveness of a Personal Computer Aviation Device, a flight training device, and an airplane in conducting instrument proficiency checks. FAA Annual Program Review. September 10, 2003, Reno, NV.

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Presentations

Taylor, H L, Talleur, D A, Rantanen, E M, Emanuel, T W, Jr. (2004). The Effectiveness of a Personal Computer Aviation Training Device (PCATD), a Flight Training Device (FTD) and an Airplane in Conducting Instrument Proficiency Checks (IPC), Presented at the Research Roundtable, Fall Education Conference of the University Aviation Association, October 8,2004, Toronto, CA, Abstract to be published.

Taylor, H L, Talleur, D A, Emanuel, T W, Jr., Rantanen, E M. (2004). The Effectiveness of a Personal Computer Aviation Training Devices (PCATDs), and Flight Training Devices (FTDs) in Instrument Training, Maintaining Currency, and Instrument Proficiency Checks, Presented at the Institutional Workshop, Fall Education Conference of the University Aviation Association, October 9, 2004, Toronto, CA, Power Point slides to be published.

Taylor, H L, Talleur, D A, Rantanen, E M, Emanuel, T W, Jr. (2004). The Effectiveness of a Personal Computer Aviation Training Device (PCATD), a Flight Training Device (FTD) and an Airplane in Conducting Instrument Proficiency Checks (IPC), Presented at the FAA FY 04 General Aviation, Vertical Flight, and Aviation Maintenance Human Factors Program Review, Washington D. C., November 16, 2004 Poster.

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APPENDIX B

Flight Experience and Biographical Data Questionnaire

We expect that the pilots involved in this project will have widely varying flight experience. To help us interpret the results of our study, we need to have some background information about your flying experience, and would like you to fill out this questionnaire and return it to us in the pre-paid envelope.

Your answers will help us classify the experience level of the participants in this project. All answers will be confidential. We will code your answers using only an arbitrary reference number assigned to each participant. The data will not be linked to your name in any way.

Please Print Your Responses

Name:__________________________ Date:___________ Ref # (   )

Date of Birth (month, day, year): [ ] Native Language: [ ]
(language you learned to speak first)

Check all Flight Certificates and Ratings you hold:

Certificates/Ratings: (or Military Equivalent)

- ☐ Private Pilot Single Engine Land/Sea
- ☐ Private Pilot Multiengine Land/Sea
- ☐ Instrument Rating
- ☐ Multiengine- Instrument Privileges
- ☐ Commercial Pilot Single Engine Land/Sea
- ☐ Commercial Pilot Multiengine Land/Sea
- ☐ Airline Transport Pilot Single Engine or Multiengine
- ☐ Certified Flight Instructor Single Engine
- ☐ Certified Flight Instructor Instrument
- ☐ Multiengine Flight Instructor
- ☐ Military Flight Instructor (list qualifications below)
- ☐ Helicopter Ratings
- ☐ Other Certificates or ratings:

____
____
____

Please list any Type Ratings you have:

____
____
____

Please fill in the approximate amount of **FIXED WING** aircraft flight time you have:

1) Total Flight Time: ☐

2) Total Simulated Instrument Time (Hood time): ☐

3) Total Actual Instrument Time (IMC conditions): ☐

4) Total Ground Trainer/Simulator Time: ☐
(such as Link, Frasca, ATC, etc.)

5) Total Personal Computer Aviation Training Device (PCATD) Time: ☐
(such as FS-100, 200; Elite PCATDs, etc)

6) Total Dual Instruction Given (if you're a CFI): ☐

7) Total Dual Instruction Received: ☐

8) Total Single Engine Airplane Time: ☐

9) Total Multiengine Airplane Time: ☐

10) Total Night Flight Time: ☐

11) Total Cross Country Time: ☐

12) Total Turbojet Time: ☐

13) Total Turboprop Time: ☐

14) What Type of Aircraft Do You Usually Fly when flying on instruments:
(Check all that apply from each column)

Configuration:	**Engine:**	**Gear:**	**Horsepower**:	**Equipment**:
☐ High Wing	☐ Single	☐ Fixed	☐ Less than 200	☐ Autopilot
☐ Low Wing	☐ Multi	☐ Retractable	☐ 200 or more	☐ Wing Leveler
	☐ Turbine	☐ Tail-Wheel		☐ HSI
	☐ Turboprop	☐ Tricycle- Gear		

15) What year (vintage) aircraft do you usually fly when flying on instruments? ☐

16) Total Recent **FIXED WING** Aircraft Flight Time:

Last 90 days	Last 6 months	Last 12 months

17) Instrument Currency:

To be instrument current, you must have completed 6 instrument approaches and at least one hold in the previous 6 months, either in an aircraft or in a flight training device or simulator.

a) Are you Instrument Current? **Circle one**: YES NO
b) If not, when were you last instrument current? (Date) ____________
c) How many Instrument Approaches have you flown in the last 6 months? _____
d) How many Holding Patterns have you flown in the last 6 months?_____
e) When did you last receive an Instrument Proficiency Check flight to renew your Instrument Currency? (Date) ____________

18) Do you have a current Flight Review (BFR)?
Circle one: YES NO

19) If you have military flight experience, please indicate types of aircraft flown here:

__________________ __________________ __________________
__________________ __________________ __________________
__________________ __________________ __________________
__________________ __________________ __________________

20) What is the main reason that you fly aircraft? Circle one:

a. For Fun
b. Commercially (Airlines, Charter, Corporate)
c. Military
d. Travel Related to my Job
e. Other (please fill in)_____________________

21) What type of flying do you normally engage in? Circle one:

a. local (within 50 miles of homebase airport)
b. Cross-Country of 50-200 miles
c. Cross-Country of 201-500 miles
d. Cross-Country of 1000 miles or greater
e. Other (please fill in)______________________

We are gathering information for a <u>FUTURE project</u> that will potentially require pilots to fly their own aircraft or a rented aircraft. Your answers to the questions that follow <u>DO NOT AFFECT</u> your involvement in the current project. If you do not own your own aircraft or rent, please disregard the rest of this questionnaire.

22) Do you own or rent a single engine aircraft that is instrument equipped and certified for flight in instrument conditions? **YES** **NO** (circle one)

If you answered NO to question 22, please stop here.

23) If you answered **YES** to question 22, would you be willing to fly this aircraft to Willard airport (CMI) for a future project and take an Instrument Proficiency Check (IPC) in that aircraft if partially reimbursed for expenses to travel to CMI? **YES** **NO** (circle one)

If you answered NO to question 23, please stop here.

24) Do you anticipate being willing **<u>and</u>** able to be pilot in command (PIC) during an IPC?
YES **NO** (circle one)

25) If you answered YES to question 23, please answer the following questions about the aircraft you would be willing bring to CMI:

a) What type of aircraft would you bring? ______________________(Full model number and year of aircraft)
b) How much flight time have you logged in this aircraft?______________ (Hours)

c) Does your aircraft have full dual flight controls? (Aileron, Rudder and Elevator controls at both front seats) **YES** **NO** (circle one)

d) Do you, or the place you rent from (in case you bring a rented aircraft) have insurance that covers instruction given by a flight instructor in that aircraft?
YES **NO** (circle one)

26) In order to assure that your aircraft would be appropriate for this project, we would perform an inspection of your aircraft and the maintenance logs at no cost to you. If your aircraft was found to be inadequate for this experiment, you would be notified in writing at the time of inspection as to the reasons why. This report would be kept confidential. In such a case, you would still be allowed to participate in the future project but using the Sundowner (BE-C23) aircraft supplied by the Institute of Aviation).

Would you be willing **<u>and/or</u>** able to present your aircrafts' (or the rented aircrafts') maintenance logs for inspection by an authorized pilot or mechanic at the time of the IPC flight at CMI? **YES** **NO** (circle one)

APPENDIX C

Training Sessions

Subject Number______________

Subjects doing these sessions are 2-5 years out of instrument currency. Please evaluate their instrument proficiency and decide what maneuver would be best suited to increase their proficiency towards an IPC signoff. They will not actually receive an IPC signoff at any point during the training but you should train them as if they were training towards and IPC signoff. The specific maneuvers chosen for practice are at your discretion, but please note any maneuvers trained below. These sessions may go on for several weeks until a subject is ready to move on to the familiarization sessions. Indicate at the end of each session whether or not you believe the subject is instrument proficient and ready to proceed to the familiarization sessions.

Session 1: Date:______________ Instructor:_________________ Hobbs Time:_____

Maneuvers Practiced:

Is this subject instrument proficient and ready for familiarization sessions? **YES NO**

Session 2: Date:______________ Instructor:_________________ Hobbs Time:_____

Maneuvers Practiced:

Is this subject instrument proficient and ready for familiarization sessions? **YES NO**

Session 3: Date:______________ Instructor:_________________ Hobbs Time:_____

Maneuvers Practiced:

Is this subject instrument proficient and ready for familiarization sessions? **YES NO**

Session 4: Date:______________ Instructor:_________________ Hobbs Time:_____

Maneuvers Practiced:

Is this subject instrument proficient and ready for familiarization sessions? **YES NO**

APPENDIX D

VFR Flight Familiarization Flight

Instructor____________________ Date__________Subject Number_______

Circle the type of device used: ***Aircraft*** ***PCATD*** ***Frasca 141***

Time flown (either by hour meter or clock) __________

VFR Flight Familiarization Schedule:

It is reasonable to assume that most of the participants do not have experience flying the equipment that we are using in this experiment. The following schedule of maneuvers is designed to provide some operating experience with the performance profiles of the PCATD, Frasca 141 and the Sundowner aircraft. These flights are carried out prior to the IPC flights. It is recommended that this training be scheduled for **one hour**. Verbal or physical intervention is allowed during the VFR training. All maneuvers during the VFR training are to be performed in VFR conditions without a hood. Check off tasks below as they are completed. All tasks should be introduced during these training sessions. On return to CMI, the subject should fly to about 2 or 3 miles from the airport. At that point, in the Aircraft, the instructor will take over. In the PCATD or Frasca, the flight may be discontinued upon reaching 2 to 3 miles from CMI.

Startup	**Completed:**
Familiarization with cockpit and checklist use	______

On taxi out:	**Completed:**
Instrument Check during taxi	______

Maneuvers:	**Completed:**
Takeoff	______
Cruise Climb	______
Level -off	______
Straight & Level	______
Slow flight	______

After reaching practice area:

180° Std. Rate Turns	______
Steep turns (45 degree bank)	______
A/S and Rate Descent (Precision Profile)	______
A/S and Rate Descent (Non-Prec. Profile)	______
NAV Radio orientation- VOR interception	______
Power-off stall/ Power-on stall	______

IPC 1- PCATD Form

Instructor____________________ Date__________Subject Number________
Data logger File Name:_________________

<u>VOR Approach</u> (DEC VOR 36 Via PT)
Please test the VOR approach first during the flight. Check "yes" or "no" to indicate whether the subject's performance met the criteria.

Task	Yes	No
1) VOR 36 Course Intercept		
Tune, Ident VOR	_____	_____
Set Proper Outbound Course	_____	_____
Properly Intercepts Course	_____	_____
Altitude ±100	_____	_____
2) VOR 36 Outbound Tracking		
Less Than Full-Scale CDI Deflection	_____	_____
Altitude ±100 ft (When holding constant altitude)	_____	_____
Heading ±10°	_____	_____
3) VOR 36 Procedure Turn		
Executes Proper Procedure Turn (Correct direction)	_____	_____
Altitude ±100 ft (When holding constant altitude)	_____	_____
Heading ±10°	_____	_____
Uses Proper Timing	_____	_____
Stays within 10nm of DEC VOR during PT	_____	_____
Resets OBS to Inbound Course (If applicable)	_____	_____
Correctly intercept FAC from inbound leg of PT	_____	_____
4) VOR 36 Inbound Tracking to FAF		
Less Than Full-Scale CDI Deflection	_____	_____
Altitude ±100 ft (When holding constant altitude)	_____	_____
Heading ±10°	_____	_____
Identifies FAF	_____	_____
Starts Descent at FAF	_____	_____
Starts Time (as necessary)	_____	_____
5) VOR 36 Final Approach Segment to MAP		
Less Than 3/4 Scale CDI Deflection	_____	_____
Airspeed ±10 kts	_____	_____
Maintains MDA +100/-0 ft	_____	_____
Properly Identifies MAP (Time or DME reference)	_____	_____
Meets Practical Test Standards	_____	_____

Instructor_____________________ Date___________Subject Number_______ IPC 1

Holding Procedures (HASSE) –**Entry and 2 full turns**
Please test the holding pattern second during the flight. Check "yes" or "no" to indicate whether the subject's performance met the criteria.

6) Holding Pattern Entry

Measure	Desired	Yes	No
Tune and Ident Proper Navaids		______	______
Sets Proper Course(s) in OBS		______	______
Recognizes Arrival at Holding Fix		______	______
Initiates Prompt Entry		______	______
Uses Recommended Entry Procedure		______	______
Properly Reports Entry		______	______
From Initial Arrival at Holding Fix to Crossing Fix on 1st Inbound Leg			
Airspeed	$\pm$10 kts	______	______
Altitude	$\pm$100 ft	______	______
On Inbound Leg			
Maintains Desired Course	$\pm 10^{\circ}$	______	______
Applies Proper Timing		______	______

First Full Holding Pattern

Measure	Desired	Yes	No
On Outbound Leg:			
Maintains appropriate Wind Correction		______	______
Applies Proper Timing		______	______
On Inbound Leg:			
Maintains Desired Course	$\pm 10^{\circ}$	______	______
Throughout Pattern:			
Airspeed	$\pm$10 kts	______	______
Altitude	$\pm$100 ft	______	______

Second Full Holding Pattern

Measure	Desired	Yes	No
On Outbound Leg:			
Maintains appropriate Wind Correction		______	______
Applies Proper Timing		______	______
On Inbound Leg:			
Maintains Desired Course	$\pm 10^{\circ}$	______	______
Throughout Pattern:			
Airspeed	$\pm$10 kts	______	______
Altitude	$\pm$100 ft	______	______

Meets Practical Test Standards		______	______

Instructor_____________________Date___________Subject Number________ IPC 1

Steep Turns

Please test steep turns third during the flight; one 360^o turn to the left and one 360^o turn to the right. Check "yes" or "no" to indicate whether the performance met the criteria.

Measure	Desired	Yes	No
7) Left 360^o Steep Turn			
Altitude	±100 ft	_____	_____
Airspeed	±10 kts	_____	_____
Bank Angle	±5^o	_____	_____
8) Right 360^o Steep Turn			
Altitude	±100 ft	_____	_____
Airspeed	±10 kts	_____	_____
Bank Angle	±5^o	_____	_____
Meets Practical Test Standards		_____	_____

Instructor_____________________ Date___________Subject Number________ IPC 1

Unusual Attitude Recovery

Please test one unusual attitude recovery immediately after the steep turns. Check “yes” or “no to indicate whether the subject’s performance met the criteria.

Task	Yes	No
Applies in appropriate order, **Bank, Pitch** and **Power** in a timely fashion during recovery.	_____	_____

ILS Approach (DEC ILS 6 Via RV)

Please test the ILS approach last while at Decatur. Check "yes" or "no" to indicate whether the subject’s performance met the criteria.

Task	Yes	No
9) ILS 6 Intercept (RV to the FAC)		
Tune, Ident Localizer	_____	_____
Identifies Proper Course	_____	_____
Altitude ±100	_____	_____
10) ILS 6 Inbound Tracking to FAF		
Less Than Full-Scale CDI Deflection	_____	_____
Altitude ±100 ft (When holding constant altitude)	_____	_____
Heading ±10°	_____	_____
Starts Time at FAF	_____	_____
Properly Intercepts Glide Slope	_____	_____
11) ILS 6 Final Approach Segment:		
Less Than 3/4 Scale CDI Deflection	_____	_____
Less Than 3/4 Scale Glide Slope Deflection	_____	_____
Airspeed ±10 kts	_____	_____
Properly Identifies MAP	_____	_____
Meets Practical Test Standards	_____	_____

Instructor______________________ Date___________Subject Number________ IPC 1

Partial Panel VOR Approach via Radar Vectors (Name of Approach ________________)
Please test a partial panel VOR approach during return to CMI. Check "yes" or "no" to indicate whether the subject's performance met the criteria.

Task	Yes	No
12) VOR Approach Intercept		
Tune, Ident VOR	______	______
Set Proper Course	______	______
Properly intercepts course	______	______
Altitude $\pm$100	______	______
13) VOR Approach Inbound Tracking to FAF		
Less Than Full-Scale CDI Deflection	______	______
Altitude $\pm$100 ft (When holding constant altitude)	______	______
Heading $\pm 10^{\circ}$	______	______
Identifies FAF	______	______
Starts Descent From FAF or as Appropriate	______	______
14) VOR Approach Final Approach Segment to MAP		
Less Than 3/4 Scale CDI Deflection	______	______
Airspeed $\pm$10 kts	______	______
Maintains MDA +100/-0 ft	______	______
Properly Identifies MAP	______	______
Meets Practical Test Standards	______	______

ATC Procedures/ Communications
Please monitor the subject's ATC procedures and communications throughout the flight. Check "yes" or "no to indicate whether the subject's performance met the criteria.

Task	Yes	No
Subject used appropriate ATC procedures and Communications during the flight	______	______

Please indicate the Hobbs time logged on this flight ____________

Would you give an IPC signoff (based on current PTS requirements) to this subject if this device were approved for giving IPCs **YES** **NO** (circle one)

IPC 1- Frasca Form

Instructor_____________________ Date___________Subject Number________
Data logger File Name:__________________

VOR Approach (DEC VOR 36 Via PT)
Please test the VOR approach first during the flight. Check "yes" or "no" to indicate whether the subject's performance met the criteria.

Task	Yes	No
1) VOR 36 Course Intercept		
Tune, Ident VOR	_____	_____
Set Proper Outbound Course	_____	_____
Properly Intercepts Course	_____	_____
Altitude ±100	_____	_____
2) VOR 36 Outbound Tracking		
Less Than Full-Scale CDI Deflection	_____	_____
Altitude ±100 ft (When holding constant altitude)	_____	_____
Heading ±10°	_____	_____
3) VOR 36 Procedure Turn		
Executes Proper Procedure Turn (Correct direction)	_____	_____
Altitude ±100 ft (When holding constant altitude)	_____	_____
Heading ±10°	_____	_____
Uses Proper Timing	_____	_____
Stays within 10nm of DEC VOR during PT	_____	_____
Resets OBS to Inbound Course (If applicable)	_____	_____
Correctly intercept FAC from inbound leg of PT	_____	_____
4) VOR 36 Inbound Tracking to FAF		
Less Than Full-Scale CDI Deflection	_____	_____
Altitude ±100 ft (When holding constant altitude)	_____	_____
Heading ±10°	_____	_____
Identifies FAF	_____	_____
Starts Descent at FAF	_____	_____
Starts Time (as necessary)	_____	_____
5) VOR 36 Final Approach Segment to MAP		
Less Than 3/4 Scale CDI Deflection	_____	_____
Airspeed ±10 kts	_____	_____
Maintains MDA +100/-0 ft	_____	_____
Properly Identifies MAP (Time or DME reference)	_____	_____
Meets Practical Test Standards	_____	_____

Instructor_____________________ Date___________Subject Number_______ IPC 1

Holding Procedures (HASSE) –**Entry and 2 full turns**
Please test the holding pattern second during the flight. Check "yes" or "no" to indicate whether the subject's performance met the criteria.

6) Holding Pattern Entry

Measure	Desired	Yes	No
Tune and Ident Proper Navaids		_____	_____
Sets Proper Course(s) in OBS		_____	_____
Recognizes Arrival at Holding Fix		_____	_____
Initiates Prompt Entry		_____	_____
Uses Recommended Entry Procedure		_____	_____
Properly Reports Entry		_____	_____
From Initial Arrival at Holding Fix to Crossing Fix on 1st Inbound Leg			
Airspeed	$\pm$10 kts	_____	_____
Altitude	$\pm$100 ft	_____	_____
On Inbound Leg			
Maintains Desired Course	$\pm 10^{o}$	_____	_____
Applies Proper Timing		_____	_____

First Full Holding Pattern

Measure	Desired	Yes	No
On Outbound Leg:			
Maintains appropriate Wind Correction		_____	_____
Applies Proper Timing		_____	_____
On Inbound Leg:			
Maintains Desired Course	$\pm 10^{o}$	_____	_____
Throughout Pattern:			
Airspeed	$\pm$10 kts	_____	_____
Altitude	$\pm$100 ft	_____	_____

Second Full Holding Pattern

Measure	Desired	Yes	No
On Outbound Leg:			
Maintains appropriate Wind Correction		_____	_____
Applies Proper Timing		_____	_____
On Inbound Leg:			
Maintains Desired Course	$\pm 10^{o}$	_____	_____
Throughout Pattern:			
Airspeed	$\pm$10 kts	_____	_____
Altitude	$\pm$100 ft	_____	_____

Meets Practical Test Standards		_____	_____

Instructor______________________Date____________Subject Number________ IPC 1

Steep Turns

Please test steep turns third during the flight; one 360° turn to the left and one 360° turn to the right. Check "yes" or "no" to indicate whether the performance met the criteria.

Measure	Desired	Yes	No
7) Left 360° Steep Turn			
Altitude	±100 ft	_____	_____
Airspeed	±10 kts	_____	_____
Bank Angle	±5°	_____	_____
8) Right 360° Steep Turn			
Altitude	±100 ft	_____	_____
Airspeed	±10 kts	_____	_____
Bank Angle	±5°	_____	_____
Meets Practical Test Standards		_____	_____

Instructor_____________________ Date___________Subject Number________ IPC 1

Unusual Attitude Recovery

Please test one unusual attitude recovery immediately after the steep turns. Check “yes” or “no to indicate whether the subject’s performance met the criteria.

Task	Yes	No
Applies in appropriate order, **Bank, Pitch** and **Power** in a timely fashion during recovery.	_____	_____

ILS Approach (DEC ILS 6 Via RV)

Please test the ILS approach last while at Decatur. Check "yes" or "no" to indicate whether the subject’s performance met the criteria.

Task	Yes	No
9) ILS 6 Intercept (RV to the FAC)		
Tune, Ident Localizer	_____	_____
Identifies Proper Course	_____	_____
Altitude ±100	_____	_____
10) ILS 6 Inbound Tracking to FAF		
Less Than Full-Scale CDI Deflection	_____	_____
Altitude ±100 ft (When holding constant altitude)	_____	_____
Heading ±10°	_____	_____
Starts Time at FAF	_____	_____
Properly Intercepts Glide Slope	_____	_____
11) ILS 6 Final Approach Segment:		
Less Than 3/4 Scale CDI Deflection	_____	_____
Less Than 3/4 Scale Glide Slope Deflection	_____	_____
Airspeed ±10 kts	_____	_____
Properly Identifies MAP	_____	_____
Meets Practical Test Standards	_____	_____

Instructor______________________ Date____________Subject Number_________ IPC 1

Partial Panel VOR Approach via Radar Vectors (Name of Approach ________________)
Please test a partial panel VOR approach during return to CMI. Check "yes" or "no" to indicate whether the subject's performance met the criteria.

Task	Yes	No
12) VOR Approach Intercept		
Tune, Ident VOR	_____	_____
Set Proper Course	_____	_____
Properly intercepts course	_____	_____
Altitude ±100	_____	_____
13) VOR Approach Inbound Tracking to FAF		
Less Than Full-Scale CDI Deflection	_____	_____
Altitude ±100 ft (When holding constant altitude)	_____	_____
Heading ±10°	_____	_____
Identifies FAF	_____	_____
Starts Descent From FAF or as Appropriate	_____	_____
14) VOR Approach Final Approach Segment to MAP		
Less Than 3/4 Scale CDI Deflection	_____	_____
Airspeed ±10 kts	_____	_____
Maintains MDA +100/-0 ft	_____	_____
Properly Identifies MAP	_____	_____
Meets Practical Test Standards	_____	_____

ATC Procedures/ Communications
Please monitor the subject's ATC procedures and communications throughout the flight. Check "yes" or "no to indicate whether the subject's performance met the criteria.

Task	Yes	No
Subject used appropriate ATC procedures and Communications during the flight	_____	_____

Please indicate the Hobbs time logged on this flight ____________

Did you give an IPC signoff (based on current PTS requirements) **YES** **NO** (circle one)

IPC 1- Aircraft Form

Instructor____________________ Date__________Subject Number________
Data logger File Name:_________________

On taxi out:	**Completed:**
Instrument Check during taxi	______

VOR Approach (DEC VOR 36 Via PT)
Please test the VOR approach first during the flight. Check "yes" or "no" to indicate whether the subject's performance met the criteria.

Task	Yes	No
1) VOR 36 Course Intercept		
Tune, Ident VOR	_____	_____
Set Proper Outbound Course	_____	_____
Properly Intercepts Course	_____	_____
Altitude ±100	_____	_____
2) VOR 36 Outbound Tracking		
Less Than Full-Scale CDI Deflection	_____	_____
Altitude ±100 ft (When holding constant altitude)	_____	_____
Heading ±10°	_____	_____
3) VOR 36 Procedure Turn		
Executes Proper Procedure Turn (Correct direction)	_____	_____
Altitude ±100 ft (When holding constant altitude)	_____	_____
Heading ±10°	_____	_____
Uses Proper Timing	_____	_____
Stays within 10nm of DEC VOR during PT	_____	_____
Resets OBS to Inbound Course (If applicable)	_____	_____
Correctly intercept FAC from inbound leg of PT	_____	_____
4) VOR 36 Inbound Tracking to FAF		
Less Than Full-Scale CDI Deflection	_____	_____
Altitude ±100 ft (When holding constant altitude)	_____	_____
Heading ±10°	_____	_____
Identifies FAF	_____	_____
Starts Descent at FAF	_____	_____
Starts Time (as necessary)	_____	_____
5) VOR 36 Final Approach Segment to MAP		
Less Than 3/4 Scale CDI Deflection	_____	_____
Airspeed ±10 kts	_____	_____
Maintains MDA +100/-0 ft	_____	_____
Properly Identifies MAP (Time or DME reference)	_____	_____
Meets Practical Test Standards	_____	_____

Instructor______________________ **Date**___________**Subject Number**_______ **IPC 1**

<u>Holding Procedures</u> (HASSE) –**Entry and 2 full turns**
Please test the holding pattern second during the flight. Check "yes" or "no" to indicate whether the subject's performance met the criteria.

6) Holding Pattern Entry

Measure	Desired	Yes	No
Tune and Ident Proper Navaids		______	______
Sets Proper Course(s) in OBS		______	______
Recognizes Arrival at Holding Fix		______	______
Initiates Prompt Entry		______	______
Uses Recommended Entry Procedure		______	______
Properly Reports Entry		______	______
From Initial Arrival at Holding Fix to Crossing Fix on 1st Inbound Leg			
Airspeed	±10 kts	______	______
Altitude	±100 ft	______	______
On Inbound Leg			
Maintains Desired Course	$\pm 10^{o}$	______	______
Applies Proper Timing		______	______

First Full Holding Pattern

Measure	Desired	Yes	No
On Outbound Leg:			
Maintains appropriate Wind Correction		______	______
Applies Proper Timing		______	______
On Inbound Leg:			
Maintains Desired Course	$\pm 10^{o}$	______	______
Throughout Pattern:			
Airspeed	±10 kts	______	______
Altitude	±100 ft	______	______

Second Full Holding Pattern

Measure	Desired	Yes	No
On Outbound Leg:			
Maintains appropriate Wind Correction		______	______
Applies Proper Timing		______	______
On Inbound Leg:			
Maintains Desired Course	$\pm 10^{o}$	______	______
Throughout Pattern:			
Airspeed	±10 kts	______	______
Altitude	±100 ft	______	______

Meets Practical Test Standards		______	______

Instructor_____________________ Date___________Subject Number________ IPC 1

Steep Turns

Please test steep turns third during the flight; one 360^o turn to the left and one 360^o turn to the right. Check "yes" or "no" to indicate whether the performance met the criteria.

Measure	Desired	Yes	No
7) Left 360^o Steep Turn			
Altitude	±100 ft	_____	_____
Airspeed	±10 kts	_____	_____
Bank Angle	±5^o	_____	_____
8) Right 360^o Steep Turn			
Altitude	±100 ft	_____	_____
Airspeed	±10 kts	_____	_____
Bank Angle	±5^o	_____	_____
Meets Practical Test Standards		_____	_____

Instructor______________________ Date____________Subject Number________ IPC 1

Unusual Attitude Recovery

Please test one unusual attitude recovery immediately after the steep turns. Check “yes” or “no to indicate whether the subject’s performance met the criteria.

Task	Yes	No
Applies in appropriate order, **Bank, Pitch** and **Power** in a timely fashion during recovery.	______	______

ILS Approach (DEC ILS 6 Via RV)

Please test the ILS approach last while at Decatur. Check "yes" or "no" to indicate whether the subject’s performance met the criteria.

Task	Yes	No
9) ILS 6 Intercept (RV to the FAC)		
Tune, Ident Localizer	______	______
Identifies Proper Course	______	______
Altitude $\pm$100	______	______
10) ILS 6 Inbound Tracking to FAF		
Less Than Full-Scale CDI Deflection	______	______
Altitude $\pm$100 ft (When holding constant altitude)	______	______
Heading $\pm 10^{o}$	______	______
Starts Time at FAF	______	______
Properly Intercepts Glide Slope	______	______
11) ILS 6 Final Approach Segment:		
Less Than 3/4 Scale CDI Deflection	______	______
Less Than 3/4 Scale Glide Slope Deflection	______	______
Airspeed $\pm$10 kts	______	______
Properly Identifies MAP	______	______
Meets Practical Test Standards	______	______

Instructor_____________________ Date___________Subject Number________ IPC 1

Partial Panel VOR Approach via Radar Vectors (Name of Approach _______________)
Please test a partial panel VOR approach during return to CMI. Check "yes" or "no" to indicate whether the subject's performance met the criteria.

Task	Yes	No
12) VOR Approach Intercept		
Tune, Ident VOR	_____	_____
Set Proper Course	_____	_____
Properly intercepts course	_____	_____
Altitude ±100	_____	_____
13) VOR Approach Inbound Tracking to FAF		
Less Than Full-Scale CDI Deflection	_____	_____
Altitude ±100 ft (When holding constant altitude)	_____	_____
Heading $\pm 10^{o}$	_____	_____
Identifies FAF	_____	_____
Starts Descent From FAF or as Appropriate	_____	_____
14) VOR Approach Final Approach Segment to MAP		
Less Than 3/4 Scale CDI Deflection	_____	_____
Airspeed ±10 kts	_____	_____
Maintains MDA +100/-0 ft	_____	_____
Properly Identifies MAP	_____	_____
Meets Practical Test Standards	_____	_____

ATC Procedures/ Communications
Please monitor the subject's ATC procedures and communications throughout the flight. Check "yes" or "no to indicate whether the subject's performance met the criteria.

Task	Yes	No
Subject used appropriate ATC procedures and Communications during the flight	_____	_____

Please indicate the Hobbs time logged on this flight ___________

Did you give an IPC signoff (based on current PTS requirements) **YES** **NO** (circle one)

IPC 2- Aircraft Form

Instructor______________________ Date___________Subject Number________
Data logger File Name:__________________

On taxi out:	**Completed:**
Instrument Check during taxi	______

VOR Approach (DEC VOR 36 Via PT)
Please test the VOR approach first during the flight. Check "yes" or "no" to indicate whether the subject's performance met the criteria.

Task	Yes	No
1) VOR 36 Course Intercept		
Tune, Ident VOR	______	______
Set Proper Outbound Course	______	______
Properly Intercepts Course	______	______
Altitude ±100	______	______
2) VOR 36 Outbound Tracking		
Less Than Full-Scale CDI Deflection	______	______
Altitude ±100 ft (When holding constant altitude)	______	______
Heading ±10°	______	______
3) VOR 36 Procedure Turn		
Executes Proper Procedure Turn (Correct direction)	______	______
Altitude ±100 ft (When holding constant altitude)	______	______
Heading ±10°	______	______
Uses Proper Timing	______	______
Stays within 10nm of DEC VOR during PT	______	______
Resets OBS to Inbound Course (If applicable)	______	______
Correctly intercept FAC from inbound leg of PT	______	______
4) VOR 36 Inbound Tracking to FAF		
Less Than Full-Scale CDI Deflection	______	______
Altitude ±100 ft (When holding constant altitude)	______	______
Heading ±10°	______	______
Identifies FAF	______	______
Starts Descent at FAF	______	______
Starts Time (as necessary)	______	______
5) VOR 36 Final Approach Segment to MAP		
Less Than 3/4 Scale CDI Deflection	______	______
Airspeed ±10 kts	______	______
Maintains MDA +100/-0 ft	______	______
Properly Identifies MAP (Time or DME reference)	______	______
Meets Practical Test Standards	______	______

Instructor_____________________ Date___________Subject Number_______ IPC 2

Holding Procedures (HASSE) –**Entry and 2 full turns**
Please test the holding pattern second during the flight. Check "yes" or "no" to indicate whether the subject's performance met the criteria.

6) Holding Pattern Entry

Measure	Desired	Yes	No
Tune and Ident Proper Navaids		______	______
Sets Proper Course(s) in OBS		______	______
Recognizes Arrival at Holding Fix		______	______
Initiates Prompt Entry		______	______
Uses Recommended Entry Procedure		______	______
Properly Reports Entry		______	______
From Initial Arrival at Holding Fix to Crossing Fix on 1st Inbound Leg			
Airspeed	$\pm$10 kts	______	______
Altitude	$\pm$100 ft	______	______
On Inbound Leg			
Maintains Desired Course	$\pm 10^{o}$	______	______
Applies Proper Timing		______	______

First Full Holding Pattern

Measure	Desired	Yes	No
On Outbound Leg:			
Maintains appropriate Wind Correction		______	______
Applies Proper Timing		______	______
On Inbound Leg:			
Maintains Desired Course	$\pm 10^{o}$	______	______
Throughout Pattern:			
Airspeed	$\pm$10 kts	______	______
Altitude	$\pm$100 ft	______	______

Second Full Holding Pattern

Measure	Desired	Yes	No
On Outbound Leg:			
Maintains appropriate Wind Correction		______	______
Applies Proper Timing		______	______
On Inbound Leg:			
Maintains Desired Course	$\pm 10^{o}$	______	______
Throughout Pattern:			
Airspeed	$\pm$10 kts	______	______
Altitude	$\pm$100 ft	______	______

Meets Practical Test Standards		______	______

Instructor_____________________ Date___________Subject Number________ IPC 2

Steep Turns

Please test steep turns third during the flight; one 360º turn to the left and one 360º turn to the right. Check "yes" or "no" to indicate whether the performance met the criteria.

Measure	Desired	Yes	No
7) Left 360º Steep Turn			
Altitude	±100 ft	_____	_____
Airspeed	±10 kts	_____	_____
Bank Angle	±5º	_____	_____
8) Right 360º Steep Turn			
Altitude	±100 ft	_____	_____
Airspeed	±10 kts	_____	_____
Bank Angle	±5º	_____	_____
Meets Practical Test Standards		_____	_____

Instructor_____________________ Date___________Subject Number________ IPC 2

Unusual Attitude Recovery

Please test one unusual attitude recovery immediately after the steep turns. Check “yes” or “no to indicate whether the subject’s performance met the criteria.

Task	Yes	No
Applies in appropriate order, **Bank, Pitch** and **Power** in a timely fashion during recovery.	_____	_____

ILS Approach (DEC ILS 6 Via RV)

Please test the ILS approach last while at Decatur. Check "yes" or "no" to indicate whether the subject’s performance met the criteria.

Task	Yes	No
9) ILS 6 Intercept (RV to the FAC)		
Tune, Ident Localizer	_____	_____
Identifies Proper Course	_____	_____
Altitude ±100	_____	_____
10) ILS 6 Inbound Tracking to FAF		
Less Than Full-Scale CDI Deflection	_____	_____
Altitude ±100 ft (When holding constant altitude)	_____	_____
Heading ±10^{o}	_____	_____
Starts Time at FAF	_____	_____
Properly Intercepts Glide Slope	_____	_____
11) ILS 6 Final Approach Segment:		
Less Than 3/4 Scale CDI Deflection	_____	_____
Less Than 3/4 Scale Glide Slope Deflection	_____	_____
Airspeed ±10 kts	_____	_____
Properly Identifies MAP	_____	_____
Meets Practical Test Standards	_____	_____

Instructor_____________________ Date___________Subject Number________ IPC 2

Partial Panel VOR Approach via Radar Vectors (Name of Approach _______________)
Please test a partial panel VOR approach during return to CMI. Check "yes" or "no" to indicate whether the subject's performance met the criteria.

Task	Yes	No
12) VOR Approach Intercept		
Tune, Ident VOR	_____	_____
Set Proper Course	_____	_____
Properly intercepts course	_____	_____
Altitude $\pm$100	_____	_____
13) VOR Approach Inbound Tracking to FAF		
Less Than Full-Scale CDI Deflection	_____	_____
Altitude $\pm$100 ft (When holding constant altitude)	_____	_____
Heading $\pm 10^{\circ}$	_____	_____
Identifies FAF	_____	_____
Starts Descent From FAF or as Appropriate	_____	_____
14) VOR Approach Final Approach Segment to MAP		
Less Than 3/4 Scale CDI Deflection	_____	_____
Airspeed $\pm$10 kts	_____	_____
Maintains MDA +100/-0 ft	_____	_____
Properly Identifies MAP	_____	_____
Meets Practical Test Standards	_____	_____

ATC Procedures/ Communications
Please monitor the subject's ATC procedures and communications throughout the flight. Check "yes" or "no to indicate whether the subject's performance met the criteria.

Task	Yes	No
Subject used appropriate ATC procedures and Communications during the flight	_____	_____

Please indicate the Hobbs time logged on this flight ___________

Did you give an IPC signoff (based on current PTS requirements) **YES** **NO** (circle one)

APPENDIX F

FAA IPC Checkpilot's Post-Project Questionnaire

Please evaluate the following statements using your experience as an IPC checkpilot in the IPC project as a basis for your decisions. Circle your level of agreement or disagreement for each statement. Return to Don Talleur when completed. Thanks!

1) If a pilot can pass an IPC in the Frasca 141 FTD, then they can pass an IPC in the aircraft.

1	2	3	4	5
Agree		Neither Agree nor disagree		Disagree

2) If a pilot can pass an IPC in the PCATD, then they can pass an IPC in the aircraft.

1	2	3	4	5
Agree		Neither Agree nor disagree		Disagree

3) If I could choose between an Aircraft or a FTD to administer an IPC, I would choose an Aircraft.

1	2	3	4	5
Agree		Neither Agree nor disagree		Disagree

4) If I could choose between an Aircraft or a FTD to administer an IPC my decision would depend on the pilot taking the test.

1	2	3	4	5
Agree		Neither Agree nor disagree		Disagree

5) If I could choose between an Aircraft or a PCATD to administer an IPC, I would choose an Aircraft.

1	2	3	4	5
Agree		Neither Agree nor disagree		Disagree

6) If I could choose between an Aircraft or a PCATD to administer an IPC my decision would depend on the pilot taking the test.

1	2	3	4	5
Agree		Neither Agree nor disagree		Disagree

7) If I could choose between an FTD or a PCATD to administer an IPC, I would choose a FTD.

1	2	3	4	5
Agree		Neither Agree nor disagree		Disagree

8) If I could choose between a FTD or a PCATD to administer an IPC my decision would depend on the pilot taking the test.

1	2	3	4	5
Agree		Neither Agree nor disagree		Disagree

9) Given my experiences administering IPCs in a FTD, IPCs should continue to be allowed in that level of ground training device.

1	2	3	4	5
Agree		Neither Agree nor disagree		Disagree

10) Given my experiences administering IPCs in a PCATD, IPCs should be allowed in that type of ground training device.

1	2	3	4	5
Agree		Neither Agree nor disagree		Disagree

11) Given my experience administering IPCs in ground training devices (such as FTDs and PCATDs), only certain pilots should be allowed to complete an IPC in those devices.

1	2	3	4	5
Agree		Neither Agree nor disagree		Disagree

Do you have any other comments or observations about giving IPCs that you would like to share? (if so, comment briefly.)

Did you employ different observation techniques to determine the pilot's competence or make your pass/fail decision in the PCATD and FTD than in an airplane? If so, please describe.

What particular characteristics of PCATD, FTD, and airplane most affected—either positively or negatively, in your judgment—your ability to effectively administer an IPC?

Rate your workload in administering an IPC in a PCATD, FTD, or an airplane. Please justify your answer.

IPC Checkpilot Post-Project Questionnaire Results

Question	N Obs	Mean	Std Dev	N	Minimum	Maximum
1	4	3.2500000	1.2583057	4	2.0000000	5.0000000
2	4	3.2500000	1.2583057	4	2.0000000	5.0000000
3	4	1.0000000	0.0000000	4	1.0000000	1.0000000
4	4	4.0000000	1.4142136	4	2.0000000	5.0000000
5	4	1.0000000	0.0000000	4	1.0000000	1.0000000
6	4	4.0000000	1.4142136	4	2.0000000	5.0000000
7	4	3.2500000	1.5000000	4	2.0000000	5.0000000
8	4	3.7500000	1.5000000	4	2.0000000	5.0000000
9	4	2.0000000	0.8164966	4	1.0000000	3.0000000
10	4	2.5000000	1.2909944	4	1.0000000	4.0000000
11	4	3.0000000	2.3094011	4	1.0000000	5.0000000