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The Role of the Beechcraft C90 GTi Aircraft Used Within the Scope of Basic Flight Training

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Abstract

The Beechcraft C90 GTi aircraft is considered one of the technically advanced aircraft under today's conditions. Technological developments in aircraft have raised the question of how such technically advanced aircraft can be integrated into flight training. In this regard, this study investigates the use of the Beechcraft C90 GTi aircraft, which is technologically more advanced than the multi-engine aircraft used in basic flight training, in the multi-engine rating training phase of the ATP integrated training. The aim of the study is to determine the training process for this aircraft, along with its training requirements and student pilots' perceptions during the training process. To this end, a case study, one of the qualitative research designs, is conducted. The data are collected through semi-structured interviews and analyzed using the descriptive analysis method. The study participants consist of 14 student pilots who have received multi-engine rating training on the Beechcraft C90 GTi aircraft at the Department of Flight Training of Eskişehir Technical University. Findings are supported by direct quotations. As a result, the advantages and disadvantages of training on the Beechcraft C90 GTi aircraft and student pilots' recommendations for improving the training are presented.

1. Introduction

In the dynamically developing aviation industry, it is necessary to ensure the suitability and applicability of flight training programs and update the aspects that need improvement. Generating training programs that can maximize the potential of student pilots during flight training is of critical importance for ensuring quality and safety in air transportation service. The Department of Flight Training of Eskişehir Technical University Faculty of Aviation and Astronautics was established to train pilots in line with the needs of the aviation industry. The program designed to provide training for this purpose uses different aircraft. Beechcraft C90 GTi is one of these aircraft. The Beechcraft C90 GTi aircraft is used to train pilots for an Airline Transport Pilot License (ATPL) at the Department of Flight Training of Eskişehir Technical University. This aircraft started to be used in the multi-engine rating phase of the ATP integrated training in May 2010. Multi-engine rating training is a process where students acquire the skills to fly as the pilot-in-command of an aircraft with more than one engine. Undergoing this training is among the requirements for becoming an airline pilot. For most pilots, multi-engine rating training can be considered the first step of flying complex aircraft. During the period when the Beechcraft C90 GTi was used, training was provided to 263 students, reaching a total of 3130.7 flight hours.

During the inspection carried out by the Directorate General of Civil Aviation on May 28-29, 2019, it was stated that "The ATP integrated course offered, which is not supposed to include type rating training, is conducted with the BE-C90 GTi aircraft, which requires type rating contrary to the relevant regulation" by referring to SHT-FCL Appendix-1.3 A.9. Hence it was decided that it is inappropriate to provide training on the Beechcraft C90 GTi aircraft in the ATP integrated course and this should be corrected.

With the development of general aviation, technically advanced aircraft have recently been used in general aviation. These aircraft generally consist of a main flight screen, a multifunctional screen with a global positioning system (GPS) containing traffic and terrain information, and a cockpit system with a fully integrated autopilot. Fatal accidents have increased with the use of technically advanced aircraft in general aviation. The inadequate training format in the field of general aviation and the necessity for improving training programs provided on these aircraft have been indicated as the reasons for this increase (Aircraft Owners and Pilots Association, 2005).

Today, the C90 GTi aircraft is considered a technically advanced aircraft. Technically advanced aircraft may include a range of specifications such as digital flight controls, high-performance engines, environmentally friendly design, modern cockpit technology, communication systems, and safety measures. With the widespread use of technically advanced aircraft, how pilot training will be integrated with the

evolving technology in these aircraft has become an important issue. In this respect, the importance of developing decision-making, situational awareness, risk management, and single-pilot resource management, along with scenario training in pilot training, has been stressed (Dornan et al., 2018).

According to the study conducted by Sülla in 2005, the transition from the single-engine phase to the multi-engine training phase in basic flight training means a new cockpit for student pilots with which they have no experience. This change means an increased mental workload for student pilots. Students were asked about stages of instrument training at which the highest mental workload occurs. According to students' answers, they experienced more workload in multi-engine training for three of the five different stages of training. The speed of the aircraft and the design of the flight indicators are regarded to be the main reasons for the increased mental workload at different stages of single-engine and multi-engine flights. It was found that flight preparation is very important to avoid such difficulties in the transition from single-engine to multi-engine training (Sülla, 2005).

The training of pilots who transition from traditional analog cockpits to modern technological cockpits, defined as glass cockpits, has been one of the important problems in the aviation industry from the 1980s to the present day. Considering incidents and accidents in the aviation industry, it has been proven that these technological advancements have changed the functioning of the cockpit, and the change in question cannot be given as an add-on to existing training. A study was conducted by Lund University School of Aviation to investigate the impact and transformation of technically advanced aircraft on basic flight training. The study revealed that the precision of the numerical information on the primary flight display (PFD) did not pose a problem for student and instructor pilots. Furthermore, it was found that the higher speed of the aircraft compared to other single-engine training aircraft posed fewer problems for student and instructor pilots. In the surveys conducted with flight instructors after the training, instructor pilots stated that they had problems finding the right information on the flight screens at the right time. According to another finding of the study, planning and preparing the training material before the training is among the main causes of successful training. Carrying out pre-airline training in modern cockpits creates an improved learning environment and contributes to both increased safety and subsequent training for pilots (Nahlinder et al., 2006).

According to the study conducted by Socha et al. in 2020, cockpit changes can affect the perception of flight data and the psychophysiological state of the pilot, especially among inexperienced pilots. The study on the effect of cockpit changes shows that the sudden change in flight data is a potential stress factor for the pilot, but the sudden change in flight data may not be regarded as a factor affecting the workload. In addition, cockpit changes may result in reduced performance. Therefore, the transition from analog to glass cockpits in basic flight training should be considered a factor affecting performance. According to another result, the acquisition of piloting habits and familiarization with the cockpit are the most important factors affecting participants (Socha et al., 2020).

Technically advanced aircraft with glass cockpits have become popular in the field of general aviation following the high-tech cockpit integration of airlines. A study conducted to investigate how the pilot, who has learned to fly in an analog aircraft, responds to emergencies in an aircraft with a high-tech glass cockpit found that pilots transitioned from emergency to safe status on analog displays more quickly. In addition, this study showed that advanced technology glass cockpits in aircraft may not be beneficial for pilots' performance (Hiremath et al., 2009).

Flight training programs should not be considered only as training of flight training organizations. This training is also a shared management process involving aircraft manufacturers, operators, pilots, and aviation safety authorities. For successful flight training, it is very important that these stakeholders receive the necessary training, as well as their awareness, experience, and opinions about the training. The goal of an effective training program is to ensure that every student pilot trained acquires the competency and proficiency required to operate safely in complex and challenging environments, considering both psychomotor skills and aviation knowledge. Although competency is defined as fulfilling basic requirements, the purpose of flight training is beyond this and is to ensure that a pilot exhibits a sustainable performance throughout their life. The Beechcraft C90 GTi aircraft used in multi-engine rating training at the Department of Flight Training of Eskişehir Technical University differs from the aircraft used for multi-engine training in other flight training organizations. Hence it is essential to receive the opinions of students who have completed their multi-engine rating training on the Beechcraft C90 GTi aircraft at the Department of Flight Training and collect data about the training program to develop and organize flight training programs.

This study's purpose is to investigate the role of the Beechcraft C90 GTi aircraft used in multi-engine rating training at the Department of Flight Training of Eskişehir Technical University. Through experiences of student pilots undergoing training at the Flight Training Department, this study aims to identify and present the training process for Beechcraft C90 GTi, the training requirements, and student pilots' perceptions of the Beechcraft C90 GTi aircraft. Furthermore, the findings of this study serve as a valuable resource for organizing the multi-engine rating training offered at Eskişehir Technical University and regulating the training provided for the aircraft used.

To achieve the stated objectives, answers are sought to the research questions below:

1. What are the opinions of student pilots about using the Beechcraft C90 GTi aircraft in multi-engine rating training?
2. What are the opinions of student pilots about the advantages and disadvantages of using the Beechcraft C90 GTi aircraft in multi-engine rating training?
3. What do student pilots recommend for more effective and efficient implementation of the training process in multi-engine rating training?

A case study, which is used to examine a specific event, group, or subject in detail, was used as the research method in this study.

2. Method

This study employs a qualitative research method to investigate the role of the Beechcraft C90 GTi aircraft in basic flight training by collecting qualitative data from student pilots at Eskişehir Technical University Department of Flight Training in multi-engine rating training. Qualitative research is a research method that presents situations or perceptions realistically and as a whole, using data collection methods such as interviews and document analysis (Yıldırım & Şimşek, 2013). In contrast to quantitative methods, it does not aim for broad generalization to large populations. Qualitative

methodology focuses on understanding specific contexts, cases, or phenomena in-depth. The findings are often not intended to be statistically representative of a larger population (Yıldırım & Şimşek, 2013, Creswell 2020).

There are different methods used in qualitative research. Different classifications are available in the literature regarding these methods. Narrative research, phenomenological research, theory-building research, ethnographic research, and case study designs are the main qualitative research designs in social sciences and health sciences literature. In this study, a case study was conducted. The case study is a qualitative research design where the researcher creates case themes and describes the situation using multiple information sources such as interviews and observations in real life or a current situation(s) (Creswell, 2020). A case study starts with identifying a specific situation involving an individual, group, or organization. The study's objective plays an important role in how the case is examined. In case studies, the emphasis is on understanding and describing the unique context and details of this specific situation—referred to as the "internal situation." Additionally, in problems with a clear purpose, research conducted to describe and understand the problem in the best way possible is defined as an instrumental situation. Presenting a detailed and in-depth perspective in case studies is essential. Data analysis in case studies may differ depending on the chosen approach. In some cases, the analysis involves the analysis of different units or components within a situation, while in others, it focuses on analyzing the situation in its entirety. Furthermore, the detailed description of the situation in the research study is important for understanding the analysis (Creswell, 2020).

In qualitative studies, semi-structured interviews are a source of data where open-ended questions included in the semi-structured interview form provide qualitative data about the situation (Büyüköztürk et al., 2014). The purpose of using semi-structured interviews in qualitative research is to benefit from people's experiences regarding the determined subject and explain how they make sense of the subject, contrary to testing a hypothesis (Türnüklü, 2000). In this data collection technique, the researcher prepares the questions they want to ask about the subject in advance. However, according to the flow of the interview, the interviewer can acquire in-depth information about the subject by asking sub-questions or more details based on the answers given.

In the present study, a semi-structured interview was used. In preparing a semi-structured interview form, expert opinion from a flight engineer and an instructor pilot was obtained to ensure that questions serving the research question are accurate, not directive, and comprehensible. This semi-structured interview form is used to obtain data regarding the opinions of student pilots who have received training on the Beechcraft C90 GTi aircraft used in multi-engine rating training at the Department of Flight Training of Eskişehir Technical University on the aircraft in question, the advantages and disadvantages of having received training on this aircraft, and students' recommendations for more effective and efficient multi-engine rating training.

The semi-structured interview form comprises eighteen questions aiming to find answers to the three research questions provided in the Introduction section. In the first section of the semi-structured interview form prepared, the participant was informed about the interview with a preliminary information text. Owing to the preliminary information text, the participant was provided with detailed information to warm up to the interview and answer the questions sincerely. Moreover, if the participant had any questions about the interview, they were answered sincerely in this section, and permission was requested to start the interview. In the second section, the prepared eighteen questions were asked to the participants. These questions included questions asked differently for the same research question. Using these questions, it was aimed at conducting interviews more reliably, collecting more detailed data by asking questions from different perspectives, and creating an environment for the participants to express themselves sincerely.

The purposive sampling method was used to determine the study group in the research. The purposive sampling method includes a sample group determined by considering whether individuals are directly related to the research subject when selecting individuals for a detailed study (Karataş, 2015). Within the scope of the study, fourteen student pilots who had received multi-engine rating training on the Beechcraft C90 GTi aircraft were interviewed.

Table 1 contains detailed information about the date, time, duration, and data collection method of the interviews with the student pilots.

Table 1. Semi-Structured Interview Data Collection Table

Code Name	Date	Time	Duration	Way of Data Collection
P1	26.08.2021	22:00	35 MIN	Semi-structured interview and audio recording
P2	26.08.2021	18:00	28 MIN	Semi-structured interview and audio recording
P3	12.08.2021	14:00	29 MIN	Semi-structured interview and audio recording
P4	25.08.2021	14:00	86 MIN	Semi-structured interview and audio recording
P5	28.08.2021	14:00	24 MIN	Semi-structured interview and audio recording
P6	19.08.2021	14:00	29 MIN	Semi-structured interview and audio recording
P7	29.08.2021	14:00	47 MIN	Semi-structured interview and audio recording
P8	27.08.2021	16:00	15 MIN	Semi-structured interview and audio recording
P9	06.08.2021	14:00	31 MIN	Semi-structured interview and audio recording
P10	18.08.2021	14:00	42 MIN	Semi-structured interview and audio recording
P11	11.08.2021	14:00	34 MIN	Semi-structured interview and audio recording
P12	13.08.2021	14:00	32 MIN	Semi-structured interview and audio recording
P13	09.08.2021	14:00	27 MIN	Semi-structured interview and audio recording
P14	23.08.2021	21:00	23 MIN	Semi-structured interview and audio recording

A code name is allocated to each participant to maintain their anonymity, keeping their identities confidential. Necessary permissions were received from the Ethics Commission of Eskişehir Technical University to conduct the interviews. Information about the research was provided to the participants at the beginning of the interview. The student pilots to be interviewed were determined based on their being voluntary, and there was no pressure on them to participate in the interview. Interviews conducted in the Zoom video call environment lasted approximately twenty to twenty-five minutes and were audio- and video-recorded with the participants' permission.

Table 2. Semi-Structured Interview Data Collection Table

Research Questions	Data Collection Tool	Data Analysis Method
Research Questions	Semi-structured interview form	Descriptive analysis

The researcher first transcribed the audio recordings taken during the interviews separately for each participant using the Microsoft Word program. Fourteen documents consisting of forty-nine thousand words and ninety-four pages were obtained by transcribing the interviews with the fourteen student pilots. Then these documents were analyzed using the descriptive analysis method with the NVivo 12 application. The descriptive analysis method organizes and interprets the data obtained from the interview within the conceptual framework created before the research and presents it to the reader by quoting the participants' statements when necessary (Karataş, 2015). Direct quotations were made from the interview records under the determined themes.

3. Findings and Comments

This section presents the findings obtained from analyzing the qualitative data collected during the research process.

3.1. Opinions of Student Pilots About Using the Beechcraft C90 GTi Aircraft in Multi-Engine Rating Training

Table 3 lists the findings regarding the research question, "What are the opinions of student pilots about using the Beechcraft C90 GTi aircraft in multi-engine rating training?".

Table 3. Opinions of Student Pilots About Using the Beechcraft C90 GTi Aircraft in Multi-Engine Rating Training

Preparing for work in the airline
Improving communication within the cockpit
Efficient multi-engine training

The interviewed student pilots stated that the Beechcraft C90 GTi aircraft, which they used in multi-engine rating training, prepared them for working in the airlines. The training on the Beechcraft C90 GTi aircraft is the final phase of the flight training for Eskişehir Technical University Department of Flight Training students. At the end of this process, students aim to apply for a job in the airlines and, if they succeed, start the type training for the aircraft deemed appropriate by the airlines. Therefore, due to the advanced features of the Beechcraft C90 GTi aircraft, receiving multi-engine training on this aircraft is also the first step of working in the airlines and adaptation for them. The student pilots' opinions on ensuring preparation for work in the airlines are as follows:

"The systems of the aircraft are as they should be in multi-engine aircraft and as in the aircraft we will fly in the future. Hence I think it is a very sufficient aircraft to prepare ourselves for the future." P6

"*When we talked to our friends who graduated before us, they said that many systems on the aircraft are very similar to the systems on airline aircraft and they have subsystems. Therefore, they said that they adapted to work in the airlines very quickly."* P2

"When I look into the cockpit of airline aircraft, at some systems and equipment, I see that I already know some things due to training on C90." P3

The student pilots interviewed expressed an opinion that multi-engine training was more efficient because they received multi-engine rating training on the Beechcraft C90 GTi aircraft. The goal of the training process on the Beechcraft C90 GTi aircraft in basic flight training is to ensure that student pilots who have previously received training on single-engine aircraft learn the flight characteristics of multi-engine aircraft, manage emergencies in multi-engine aircraft, handle the aircraft, and experience the take-off, approach, etc. skills they have practiced on single-engine aircraft in multi-engine aircraft. Additionally, in multi-engine training, student pilots carry out flight training by reducing the power of one engine of the aircraft and creating asymmetrical thrust with the operation of the other engine, so they experience processes such as approach and go-around. The interviewed student pilots think that receiving this training on the Beechcraft C90 GTi aircraft enabled them to complete it fully and safely since the aircraft in question has powerful engines. P9 described this in the following way:

"The C90 aircraft is really much more powerful than the training aircraft in other flight schools and is among the aircraft with single-engine approach and go-around features. Especially the fact that it has a turboprop engine was very beneficial. As I said, during the single-engine go-around phase, there was not a lot of altitude loss, or we didn't need things like increasing vertical speed to gain speed." P9

Furthermore, the student pilots indicated in the interviews that they effectively used the auxiliary equipment in technically advanced aircraft. It can be thought that this reduces the potential stress factor caused by the change of cockpit and aircraft for students who start multi-engine flights after single-engine aircraft. The opinions of the other student pilots who expressed their opinions about the efficiency of multi-engine training are given below:

"I find the C90 aircraft sufficient, especially in terms of performance. One of the most important issues here is the ability to carry out single-engine training on twin-engine aircraft. I think the C90 aircraft is quite sufficient in this regard." P6

"This aircraft was very good in those matters. For example, ILS. While it was more difficult to keep the TB20 aircraft on the ILS line in very windy or turbulent weather, it was much easier to perform ILS on the C90 aircraft. Having a flight director is also a big plus. When you use the flight director, you can see the error and intervene very quickly." P11

"It is an aircraft that can provide more than required for multi-engine training. I do not see any negative aspects." P5

3.2. Opinions of Student Pilots About the Advantages and Disadvantages of Using the Beechcraft C90 GTi Aircraft in Multi-Engine Rating Training

Table 4 contains the findings for the research question, "What are the opinions of student pilots about the advantages and disadvantages of using the Beechcraft C90 GTi aircraft in multi-engine rating training?".

Table 4. Opinions of Student Pilots About the Advantages and Disadvantages of Using the Beechcraft C90 GTi Aircraft in Multi-Engine Rating Training

Advantages	Disadvantages
Similarity of the cockpit and avionics	Rigid flight control levers
Having a flight management system (FMS)	Being high-performance
Single-engine training	The long turnaround time of the aircraft
Type rating	License renewal cost
Aircraft size	

3.2.1. Findings on the advantages

The advantages were summarized into five sub-themes based on interviews with pilot students who had received multi-engine training on the Beechcraft C90 GTi aircraft. The student pilots interviewed in the similarity of the cockpit and avionics category stated that they found the cockpit of the Beechcraft C90 GTi aircraft similar to the cockpit of the aircraft they planned to fly in the airlines in the future and some of the avionic equipment in the Beechcraft C90 GTi aircraft would be an advantage for them in the future. P1 expressed his opinion on this issue as follows:

"When I sat in the cockpit of the C90 aircraft, it generally reminded me of airline aircraft, such as Boeing 737 and A320. Our goal after graduating from this school is to work for airline companies. In this respect, when I sit in the cockpit of the C90 aircraft, I feel like I am sitting in the seat of Boeing 737 or A320. And the fact that it is a light aircraft, and a training aircraft has made me feel that it is actually my first step before working directly in the airlines." P1

Some private airlines conduct simulator exams during the pilot recruitment process. Student pilots who have received training on the Beechcraft C90 GTi aircraft are expected to adapt to the exam environment more easily due to the similarity of the cockpit during these exams. After the multi-engine training on the Beechcraft C90 GTi aircraft, the students realized the similarities of the cockpits, which they set as their goal after graduation and would be their future working environments, with that of the C90 GTi aircraft. The opinions of the student pilots on this issue are presented below:

"The systems inside the aircraft are exactly the same. The only difference is that we have one FMS, but there will be two of them in the airlines; only the auto-throttle system will be added. Currently, when I watch the videos of the airlines' Airbus 320 or Boeing 737, I don't feel anything unfamiliar because since I have flown on the C90 aircraft, many things and all kinds of systems are familiar to me." P14

"The biggest advantage of having received multi-engine training on the C90 aircraft is that it is very similar to the Boeing and Airbus aircraft that we dream of and want to fly in the future. It is really very similar, from its FMS to its operating principle and cockpit layout." P2

"As I mentioned before, the cockpit environment is definitely very similar to the cockpit environment of a Boeing 737 aircraft." P10

For the sub-theme of having an FMS under the theme of the advantages of using the Beechcraft C90 GTI aircraft in multi-engine rating training, students indicated the FMS, used for performance management, flight plans, flight guidance, and monitoring flight operations in airline flights, as an advantage of the multi-engine training they received. The student pilots' opinions on this issue are given:

"We talk to other graduates. Those who fly Boeing 737 say, "We have actually learned the FMS at school." I've even learned that the FMS of the same company is used in some aircraft. I have become familiar with using these systems, and I have learned not only how to use this system but also how to use it during the flight. In fact, while performing an FMS flight, I saw how important it is to transition to a flight with a different instrument system due to malfunction or something else, to flight with systems such as VOR, and to maintain the adaptation here." P3

"I think the most important advantage is the FMS because when we talked to our older friends working in the airlines, they always used to mention that the FMS on our aircraft is very close to those of Boeing or A320 in the airline. So they used to say that working in the airline after having learned this FMS provided an extra advantage for them." P2

"The biggest advantage is the FMS. We have gained a great advantage, especially due to the routes we enter in the FMS and the procedures we implement in the FMS." P12

In the single-engine training sub-theme of the theme of advantages of using the Beechcraft C90 GTi aircraft, the student pilots stated that during their flights on the Beechcraft C90 GTI aircraft, they underwent the single-engine training required in multi-engine training without any problems on the Beechcraft C90 GTi aircraft due to the aircraft's performance, which was an advantage for them. The opinions of the student pilots on this issue are presented below:

"It is very important to receive multi-engine training on a high-performance aircraft very similar to the aircraft we want to fly in the future and to be able to truly undergo single-engine training, i.e., to be able to cut the torque of one engine and make a pass with the other engine. And the aircraft must have power for this. Being able to complete all of these is a great advantage for student pilots." P6

"As I've heard from instructor pilots, most multi-engine aircraft do not have single-engine approach and go-around features, and they cannot perform them due to insufficient power. However, each engine of the C90 aircraft has turboprop 750 shaft power, and we could easily make a pass around the runway or perform a single-engine approach with its single engine." P9

"I think the biggest advantage is single-engine training, as I also mentioned in the beginning. We experienced single-engine flight at every phase of the flight, in level flight, descent, climb, go-around, and landing. This is the biggest advantage." P13

In the type rating sub-theme of the theme of advantages of using the Beechcraft C90 GTi aircraft in multi-engine rating

training, students consider this as an advantage since they also received the type rating for the aircraft during the multi-engine training on the Beechcraft C90 GTi aircraft. P5 expressed his opinion regarding this by saying, *"Since C90 is a type-rated aircraft, we acquire type rating for four types, BE90-99-100 and BE200, which provides us with a great advantage in working life."* The student pilots' opinions on this issue are given below:

"Type rating is definitely an advantage. Currently, our graduates who have received training on this aircraft have a type rating recorded in their licenses additionally, and when we talk to our friends who have graduated, I think that graduates adapt more easily to airlines because, in this type rating, we fly the glass cockpit and high-performance aircraft." P12

Considering the aircraft size sub-theme, P10 expressed his opinion on this issue in the following way:

"The aircraft size is also an advantage. It is better in size than other multi-engine aircraft. I mean, the aircraft used by other schools are usually smaller, and they can host only two people. However, since it is a slightly more VIP aircraft, we learn to fly a slightly larger aircraft. We actually learn doing environmental control and using a larger aircraft on taxiways and the apron." P10

3.2.2. Findings on the disadvantages

The student pilots' opinions on the disadvantages of using the Beechcraft C90 GTi aircraft in multi-engine rating training specified in Table 4 are classified into four sub-themes. In the sub-theme of rigid flight control levers, the student pilots stated that the flight controls were rigid, causing some difficulties for them. The opinions of the student pilots on rigid flight controls are presented below:

"What everyone says is actually that the yoke is very heavy. But the pedals are also very heavy and it is very difficult to hold the brakes, especially on the ground." P4

"The only disadvantage I mentioned in the aircraft was its brakes. It required a lot of strength, and of course, we could do this together with our instructors by asking for help from them. Apart from that, I did not mention any disadvantages in the C90 aircraft." P6

"The most difficult part for me was trying to control the aircraft at the take-off point and landing because pulling the yoke was very difficult for me. Apart from that, I can't mention any disadvantages." P14

In the second sub-theme of the disadvantages, the student pilots indicated the fact that the Beechcraft C90 GTi aircraft is a high-performance aircraft as a disadvantage. The student pilots' opinions on the aforesaid issue are given below:

"As a disadvantage, the high performance of the aircraft can actually cause difficulties for student pilots because things may escape our control. Since the aircraft is very high-performance, for example, we may miss the altitude at which we will reach level flight when climbing. Because it is a high-performance aircraft and the aircraft on which we have received training before have lower performance, I can miss the altitude at which I want to take a level flight while focusing on something else." P1

"In multi-engine training, sometimes there may be places where we experience difficulties during the flight. I mean, we also undergo engine failure training, especially in the single-engine training part. In this part, since the engine of the aircraft is very powerful, when we reduce it to a single engine, it becomes a little difficult to control the aircraft and it is a bit tiring physically. Apart from that, I did not mention any disadvantages." P10

P4 expressed his thoughts in the sub-theme of the long turnaround time of the aircraft, another sub-theme of the disadvantages, in the following way:

"A small disadvantage of the C90 aircraft is that since it is a very large aircraft and has many systems, the preparation on the ground takes a very long time. I mean, it normally takes an average of 30 minutes. After the engine starts, when starting to taxi, the chock is taken and the duty period begins. However, since the duty period is one and a half hours long and 30 minutes are spent on the ground, there is only an hour left for the flight. Therefore, the long preparation on the ground is a disadvantage of the aircraft." P4

In the license renewal cost sub-theme, the student pilots interviewed stated that the renewal cost of a multi-engine rating license is higher compared to other aircraft when its validity period expires, which is a disadvantage. P9 expressed his opinion on this issue as follows, *"If we consider it as training, I don't see any disadvantages. We only need to do a check flight, which we call license renewal, after a year, which is a bit costly."*

3.3. Recommendations of Student Pilots for More Effective and Efficient Implementation of the Training Process in Multi-Engine Rating Training

Three categories were determined regarding the research question, "What do student pilots recommend for more effective and efficient implementation of the training process in multi-engine rating training?," and these categories are given in Table 5.

Table 5. Recommendations of Student Pilots for More Effective and Efficient Implementation of the Training Process in Multi-Engine Rating Training

Increasing the MCC flight time
Increasing the instrument flight time
Increasing the avionics course hours

Three categories were developed based on the recommendations from student pilots interviewed, aimed at achieving a more effective and efficient implementation of the multi-engine rating training process. The student pilots interviewed in the category of increasing the MCC flight time stated that the MCC training they received before the multi-engine rating training facilitated the adaptation to the Beechcraft C90 GTi aircraft along with the practices aimed at improving the communication between pilots, they obtained prior knowledge about the systems of the aircraft, and this adaptation would be enhanced by increasing the MCC flight times. Hence, they recommended increasing the MCC flight time. The student pilots' opinions on this issue are presented below:

"We actually get used to the C90 aircraft while receiving MCC training. So, if we extend the MCC process, I think the complexity and high performance of the C90 aircraft will no longer be an obstacle for students. Hence MCC can be extended." P1

"*The MCC hours related to the training process can be increased, we can get to know the aircraft better in the simulators, and perhaps we can get used to the cockpit better."* P8

"Since the simulator we use in MCC training before we start flying and the C90 cockpit are exactly the same, I think it will be a significant advantage for cockpit adaptation if the MCC duration is increased." P14

Concerning the category of increasing the instrument flight time in line with the recommendations of the student pilots interviewed, they find the instrument flight time in the training they received on the Beechcraft C90 GTi aircraft inadequate and think that it should be increased. The opinions of the student pilots under this category are presented below:

"I think that increasing instrument flight times on the C90 aircraft and performing operations in other places will contribute more." P5

"On C90, we fly 6 sorties in visual flights, 2 sorties in instrument flights, and 2 sorties in simulators, and then we take control. The visual flight part could perhaps be reduced to 4 or 5 sorties, and the instrument flight part could be increased." P7

"I think the flight time of C90 should definitely be increased. I believe that flight times, both visual flight and instrument flight times, must be increased." P4

P1, one of the student pilots interviewed in the category of increasing the avionics course hours within the research question, "What do student pilots recommend for more effective and efficient implementation of the training process in multi-engine rating training?", expressed his recommendation for improving the multi-engine rating process as follows:

"If I had to summarize the training process again, I would like the avionics course to be extended in terms of ground courses. By the way, I want the avionics course to be extended because I find it very beneficial, and since the instructor who teaches the avionics course and the instructor's preparation for the course and the documents, he presents to us are also very useful, the course can be kept longer to benefit more from it and for students to reinforce what they have learned." P1

4. Discussion

This section provides a discussion of the findings presented in the previous section as well as recommendations developed based on these findings.

The thesis study titled "The Role of the Beechcraft C90 GTi Aircraft in Basic Flight Training" attempted to determine the opinions of the student pilots who completed the multi-engine rating training on the Beechcraft C90 GTi aircraft about the training process, the advantages and disadvantages of the training on the Beechcraft C90 GTi aircraft, and their recommendations for more effective and efficient implementation of the training process. The findings obtained within the scope of the research subject are presented under the three research questions.

Upon addressing the findings for the research question, "What are opinions of student pilots about using the Beechcraft C90 GTi aircraft in the multi-engine rating training?", it is seen that the student pilots interviewed regard receiving multi-engine rating training on the Beechcraft C90 GTi aircraft to be the first step of the type rating they will receive during the airline training process for student pilots who aim to work in private airline companies after graduation since the Beechcraft C90 GTi aircraft has similar systems and equipment with the aircraft in the airline fleets. According to the study by Nahlinder et al. (2006), cockpit operation changes with technological developments in the aviation industry. Flight training organizations have difficulty adapting to change due to limited funding. Considering the student pilots' opinions about the Beechcraft C90 GTi aircraft, it can be stated that the aircraft in question is oriented toward technological change in the aviation industry and cockpit operation and is suitable for the change expected from flight training organizations and the training of new pilots.

In the study, the student pilots stated that during the training on the Beechcraft C90 GTi aircraft, unlike the previous training flights, they communicated better with the instructor pilot due to the lower noise level in the flights on this aircraft. In the study by Nahlinder et al. (2006), flight instructors thought that conducting training flights on aircraft with advanced cockpit noise cancellation systems creates a better training environment for student pilots. In this case, it seems that flights on the Beechcraft C90 GTi aircraft are a more efficient training environment for student pilots.

Since the Beechcraft C90 GTi aircraft has high-performance turboprop engines, the requirements and training practices of the multi-engine rating training were fully met in the study. The study by Sülla (2005) found that the higher cruising speeds of multi-engine training aircraft compared to single-engine training aircraft increase the mental workload on student pilots. The researcher emphasized the importance of flight preparation to avoid such problems. In the training plan of Eskişehir Technical University Flight Training Department, student pilots receive MCC training on a simulator similar to the Beechcraft C90 GTi aircraft prior to multi-engine rating training. This process is considered a preparation for multi-engine training.

Upon examining the sub-theme of the advantages for the research question, "What are the opinions of student pilots about the advantages and disadvantages of using the Beechcraft C90 GTi aircraft in multi-engine rating training?", it is seen that there are more advantages than disadvantages. The student pilots interviewed regard the similarity of the cockpit of the Beechcraft C90 GTi aircraft to the cockpit of passenger aircraft as an advantage. The study by Socha et al. (2020) stressed that, according to the information from airline pilots, it is essential that the aircraft used in basic flight training have advanced cockpit equipment. Therefore, it is important to understand the impact of the cockpits of training aircraft used in basic flight training. The student pilots interviewed regard receiving training on an aircraft with a Flight Management System (FMS), being able to experience single-engine training at every stage of the flight, giving a multi-engine rating as well as a type rating for the Beechcraft C90 GTi aircraft to those who have successfully completed the training, and the size of the aircraft as advantages.

Upon examining the disadvantages sub-theme, the student pilots interviewed regard the rigid flight control levers as a disadvantage. In terms of flight safety, instructor pilots should consider this when student pilots are in control of the aircraft. Student pilots consider the fact that the aircraft is high-performance as a disadvantage. As indicated by Sülla (2005), the speed of the aircraft increases the mental workload on student pilots, which student pilots consider as a disadvantage. Another disadvantage reported by student pilots is the long turnaround time of the aircraft. Flight planning should be made by considering this preparation process. Multi-engine rating is a type of license that should be renewed. If license renewal is required after training, it is found that the license renewal cost

for the Beechcraft C90 GTi aircraft is higher in comparison with other multi-engine aircraft.

The recommendations of the interviewed student pilots for the research question, "What do student pilots recommend for more effective and efficient implementation of the training process in multi-engine rating training?" were evaluated. The study by Sülla (2005) emphasized the great importance of flight preparation in the transition to multi-engine flight training after single-engine flight training in basic flight training. The interviewed student pilots recommend increasing the flight duration of the MCC training they received as simulator training before their flights on the Beechcraft C90 GTi aircraft. Increasing the MCC flight time can prepare student pilots better for their training on the Beechcraft C90 GTi aircraft. Moreover, increasing the weekly course hours of avionics ground lessons can contribute to flight preparation. Multi-engine rating training on the Beechcraft C90 GTi aircraft consists of two phases: type training and instrument flight training. Instrument flight training includes 5 hours in total, 3 hours of which take place in the FNPT II simulator. The interviewed student pilots think that the instrument flight training, which is conducted as 2 hours on the C90 aircraft except for the simulator, should be increased. If multi-engine rating training is continued on the Beechcraft C90 GTi aircraft, it may be considered to increase the duration of instrument flight training on the Beechcraft C90 GTi aircraft.

4. Conclusion

Aircraft are means of transportation using technology at the highest level. Their technologies are updated every day. The competencies expected from pilot candidates increase depending on these developments. Furthermore, the rules set by aviation authorities for basic flight training should also be applied in line with the requirements of the day, along with the above-mentioned developments. It is especially important to conduct research that reveals the experiences and opinions of student pilots and instructor pilots who are directly involved in basic flight training. Training practices can be regulated by considering the opinions of student pilots during the multi-engine rating training process.

In line with these thoughts, the Beechcraft C90 GTi aircraft used in the multi-engine rating phase of basic flight training was evaluated by receiving the opinions of student pilots.

The study results have demonstrated the evident and significant benefits of using the Beechcraft C90 GTi aircraft, which is considered a technically advanced aircraft, in the multi-engine rating training phase of the ATP integrated training.

Future research should investigate how to eliminate the issues specified as disadvantages and how more technological aircraft can be integrated into flight training without violating flight safety.

Conflicts of Interest

There is no conflict of interest with any person or institution.

References

Aircraft Owners and Pilots Association. (2005). Technically advanced aircraft - Safety and training. Frederick

Büyüköztürk, Ş., Kılıç Çakmak, E., Akgün, Ö. E., Karadeniz, Ş., & Demirel, F. (2014). Bilimsel Araştırma Yöntemleri [Scientific Research Methods]. Ankara: Pegem Akademi.

Creswell, J. (2020). Nitel Araştırma Yöntemleri [Qualitative Research Methods]. Ankara: Siyasal Kitabevi.

Dornan, W., Craig, P., Gossett, S., & Beckman, W. (2018). Best evidence for the FAA Industry Training Standards (FITS) program for pilot training in technically advanced aircraft. The Collegiate Aviation Review International.

Federal Aviation Administration. (2022, 04 18). Aviation Instructor's Handbook. Retrieved from https://www.faa.gov/regulations_policies/handbooks_manuals/aviation/aviation_instructors_handbook.

Hiremath, V., Proctor, R., Fanjoy, R., Feyen, R., & Young, J. (2009). Comparison of Pilot Recovery and Response Times in Two Types of Cockpits. Human Interface and the Management of Information. Information and Interaction (pp. 776-775). San Diego: Springer Berlin, Heidelberg.

Karataş, Z. (2015). Sosyal Bilimlerde Nitel Araştırma Yöntemleri [Qualitative Research Methods in Social Sciences]. Manevi Temelli Sosyal Hizmet Araştırmaları Dergisi, 62-80.

Nahlinder, S., Dahlstrom, N., & Dekker, S. (2006). Introduction of technically advanced aircraft in ab-initio flight training. Technical Report.

Sülla, D. (2005). Mental arbetsbelastning: jämförelse av flygning under enmotorskedet med flygning under tvåmotorskedet.

Socha, V., Socha, L., Hanakova, L., Valenta, V., Kusmirek, S., & Lalis, A. (2020). Pilot's performance and workload assessment: Transition from analogue to glass-cockpit. Applied Sciences, 5211.

Türnüklü, A. (2000). Eğitimbilim Araştırmalarında Etkin Olarak Kullanılabilecek Nitel BirAraştırma Tekniği: Görüşme [A Qualitative Research Technique That Can Be Used Effectively in Educational Research: Interview]. Kuram ve Uygulamada Eğitim Yönetimi, 543-559.

Yıldırım, A., & Şimşek, H. (2013). Sosyal Bilimlerde Nitel Araştırma Yöntemleri [Qualitative Research Methods in Social Sciences]. Ankara: Seçkin Yayıncılık.

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