POLITEKNIK BANTING SELANGOR

COMPFIXED

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DEPARTMENT OF AIRCRAFT MAINTENANCE

SESSION: 1 2025/2026

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A REPORT SUBMITTED TO DEPARTMENT OF AIRCRAFT
MAINTENANCE IN PARTIAL FULFILMENT OF THE REQUIREMENTS
FOR A DIPLOMA
ENGINEERING IN AIRCRAFT MAINTENANCE

SUPERVISOR:

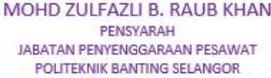**Ts. MUHAMAD FAROUK BIN ABDUL RASHID**

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CERTIFICATION OF PROJECT ORIGINALITY & OWNERSHIP

COMPFIXED

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"We hereby declare that this report is the result of our own work, except excerpts that we have outlined its sources, and this project will be the ownership of polytechnic.

———————————————
SIGNATURE: WRITER 1

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SIGNATURE: WRITER 2

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SIGNATURE: WRITER 3

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SIGNATURE: WRITER 4

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ACKNOWLEDGEMENT

ABSTRACT

The aviation industry demands high accuracy and proper understanding of maintenance procedures, especially in composite repair, where mistakes can lead to safety risks and costly damage. In educational institutions, including aviation training centers, students rely on traditional classroom learning, which provides limited exposure to real repair processes. This creates a gap between theoretical understanding and practical performance, making it difficult for learners to gain confidence before carrying out actual composite repairs. Additionally, hands-on training is often restricted due to high material costs, limited resources, and safety concerns, resulting in fewer opportunities for students to practice the repair effectively. COMPFIXED, an online educational application intended to improve students' and technician workers' comprehension of composite repair processes and procedures. The main objective of this project is to develop an organized, user-friendly platform that provides knowledge and understanding towards repair instructions in a digital format. Created using JotForm, COMPFIXED allows the embedment of interactive learning resources including infographics, notes, checklist and quiz assessments. The interface is designed with a simple, user-friendly style and a cool- dark theme to provide a clear eye-soothing and comfortable learning experience. All the app's contents are organized in line with the proper repair flow, based on Repair No. 9: Damage to Fastener Holes with Laminating Resin and Chopped Fibers as outlined in the Boeing 737-400 Structural Repair Manual (SRM). This app will act as early preparation for students before they are conducting the composite repair by themselves. As the results, from 32 respondents, 78.1% rated the app 4–5 stars, showing strong support for improved repair understanding. Users will gain proper knowledge and exposure to essential skills before tackling the repair. Other than that, due to its simpleness of user interface, organized and straightforward content arrangements are making this app super convenient and easy to use.

Keyword: *SRM: Structural Repair Manual, Repair 9: Damage to Fastener Holes with Laminating Resin and Chopped Fibers*

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LIST OF ABBREVIATIONS

ABBREVIATION	MEANING
AMM	Aircraft Maintenance Manual
CFRP	Carbon Fiber Reinforced Polymer
COMPFIXED	Composite Fix Education Digital
GFRP	Glass Fiber Reinforced Polymer
MCO	Movement Control Order
SRM	Structural Repair Manual

LIST OF APPENDICES

CHAPTER 1

INTRODUCTION

1.1 BACKGROUND OF STUDY

In modern aircraft, most components are constructed of composite materials since they're robust, light and don't rust. Currently, most learn composite repair through classes in person or on the job. However, not everyone can attend the classes, and they may be costly or difficult to attend. To eradicate this problem, this project is going to develop an online learning platform to teach composite repair. With this app students and technicians can learn anywhere anytime. This platform contains lessons, videos and interactive content to help users learn the process in inspecting and repairing composite parts. This app will simplify learning, Make it quicker and more flexible for all.

1.2 PROBLEM STATEMENT

The aviation industry is a place where anything should be done perfectly and ensuring there's no mistakes and flaws involved as any simple mistake can result in a catastrophic event. Therefore, it is crucial for maintenance students and personnel to have enough exposure before carrying out any maintenance repair or procedure on real aircraft. In my institution, which is Politeknik Banting, students are supposed to be exposed to more real time repair simulation rather than in class learning that has proven not to effective. These conventional methods often lack interactive and practical learning experiences, making it difficult for learners to fully understand the repair procedure. The data obtained from pre-survey shows that most learners faced limited hands-on experience (44.4%) and difficulty understanding technical concepts (33.3%), followed by lack of resources (22.2%).

Additionally, getting hands-on training for composite repairs can be difficult because materials are expensive, not always available, and sometimes have safety risks. Without enough practice, students may find it hard to develop the skills and confidence needed to perform repairs properly in real maintenance work. To overcome this problem, COMPFIXED, a digital learning application, goals to create a simple learning platform with step-by-step guides, informative pictures, checklist of equipment needed and video tutorials to help students and technicians learn composite repair techniques. It is also equipped with a quiz assessment page to test users' comprehension towards repair they learn. It provides a way for them to practice and understand the skills, especially when hands-on training isn't always possible. By offering this type of learning, the goal is to help students develop their skills and be better prepared for real maintenance work in the aviation industry

1.3 PROJECT AIMS AND OBJECTIVES

1.3.1 General Project Aims and Objectives

The goal of our project is to ensure students at Politeknik Banting and other aircraft maintenance training organization are prepared with the necessary knowledge before performing the task.

The project objectives are:

- To design a digital learning application that aims at enhancing students' understanding before engaging in real maintenance tasks such as composite repair
- To develop the digital learning application using JotForm that helps students to learn anytime and wherever they are
- To evaluate the effectiveness of the app in improving student knowledge and readiness for practical composite repair tasks through feedback and performance assessment

1.3.1 Specific Individual Project Objective

1.3.1.1 Product Structure

COMPFIXED is a digital learning app that focuses on composite repairs on aircraft. Just like a textbook in our own pocket, this app includes the essential learning material of composite repairs such as the tools that needed, type of materials, step by step guidance and study notes for students. They can navigate through the material by simply pressing each menu button using their personal mobile phone. This also provides assessment so that students' understanding towards the subject can be assessed by lecturers

1.3.1.2 Product Mechanism

The product is a steppingstone for students to learn new skills, which is composite repair without attending physical classes. Students can use this product anywhere and anytime. This product will include video simulation that will show the procedure of composite repair step by step. The video simulation will be the main guidance for students as it is easy to understand and can provide vision and movement. Other than that, the product will be equipped with infographic notes for the students to read the important points and extra information. Lastly, to ensure students are eligible and prepared to perform the composite repair, an assessment method will be added in this app. All the features are arranged in organized order in sequence starting from the introduction, quick repair notes, checklist of items needed, repair videos and lastly quiz assessments.

1.3.1.3 Software / Programming

Jotform is a software for building a mobile app that offers many tools for users in developing mobile apps, easy to design the app and online editing which can be reached by group members anytime anywhere. Canva is a graphic design platform that is used to design logo and interior background of the app. Google forms is a web-based tool for creating quizzes, conducting surveys, and data collection for any event. Google forms have been used to create assessments and quizzes in the app.

1.3.1.4 Accessories & Finishing

COMPFIXED is a user-friendly learning tool app, and it is not that hard to navigate through the app and look for a certain topic by merely using the search button. Just like in other apps, it also shows learning progress and control of learning by the user since the booked content will be available in offline mode after downloading, it also has quiz notification features. Inside, it is quite cozy to view with information and features like color codes and readable fonts. The features include smooth button distribution and

functionality, as well as animations that make it concise but memorable. Videos are highly clear, and images and notes are quite readable. One can use it even on tablets and mobiles, and thus people can use the application to gain knowledge anywhere and anytime, along with their data being safe with these secure logins

1.4   SCOPE OF PROJECT

1.4.1   General Project Scopes

The Digital Learning Application, COMPFIXED, for composite repair was developed to assist students to be prepared with the necessary knowledge before stepping into the hands-on task. This is to ensure there are less mistakes occurring during the practical task performed

The apps will be equipped with features such as tutorial video, virtual simulation and assessment to help the student gain the knowledge of composite repair. Designing the user interfaces, creating the systems, and preparing the instructional materials are the first steps in the development of this digital learning application.

Develop using Jotfrom, COMPFIXED focus on repair on the SRM of Boeing 737 which is Repair no. 9: Damage to fastener holes with laminating resin and chopped fibers. And all related contents of this app will have same focus as repair No.9.

1.4.2 Specific Individual Scopes

1.4.2.1 Application Structure

COMPFIXED will be focusing on getting students fully prepared with basic composite repair knowledge before they conduct the real time repairing. This app equipped with button of option menu to access each type of content in the mobile app. Thus allow the user to simply navigate all the content through the app. The development platform of this application is Jotform that is more effective compared to another developing method such as Phyton and Appy Pie

1.4.2.2   Application Mechanism

The video simulation will be self-provided. Instead of taking any sources from the internet. By doing that, we can make it as easy as it can be for students to understand it. After that, the infographic notes that will be used are from the structure repair manual. This is to ensure the information that the student receives is correct in accordance with the manual. Lastly, the assessment method that will be integrated within the app is a quiz. This assessment will be created using Google Form, as it's one of the easiest and most common platforms that have been used by students and lecturers.

1.4.2.3   Software / Programming

The COMPFIXED stands for (Composite – Fix – Education – Digital) was developed to assist Politeknik Banting students and learning instructors in learning the essential composite repair techniques required for aircraft maintenance. The scope of this project is to provide a practical and straightforward learning experience that helps users gain the necessary skills and knowledge to perform repair effectively. Additionally, the app will offer a variety of learning materials, including simulations and step-by-step guides, covering the core concepts and hands-on skills involved in composite repair. It will prioritize real-world repair procedures, troubleshooting methods, and industry standards to ensure that the training is both applicable and up to date with current practices. The app is developed by using Jotform, which is software for app development with various tools that help with making mobile apps. With this software, developing an interactive learning mobile application for composite repair would be easy and quick. Designing the user interfaces, creating the systems, and preparing the instructional materials are the first steps in the development of this digital learning application. This learning application contains interactional layout, video tutorial, materials explanations, composite repair notes, and quiz about composite repair.

1.4.2.4   Accessories & Finishing

For learning composite repair prior to practical sessions, the COMPFIXED app is highly recommended. The app features instructional videos, simulations, quizzes, and a user-friendly and intuitive interface. All the videos and notes are based on the original repair book to ensure precise information. Google Forms was used to develop the quizzes, and Jotform was used to develop the app, so it is very productive.

The app has a lovely design that is easy to use with clear text and smooth buttons, as well as small animations. The app is responsive and fully supported on phones and tablets. The login feature will secure each student's information, and regular updates will improve performance by removing any bugs.

1.5 PROJECT IMPACT

This project ensures that students acquire the basic knowledge before entering the field to work practically and therefore provision them with the prerequisite condition for performing any hands-on work with safety and confidence. In addition, they learn the use of digital tools cutting on paper uses which obviously support green technology; this greatly reduces costs involved in using papers during learning activities. It is a good step toward environmental protection and encourages eco-friendly learned methods. The project also familiarizes students with modern technology that is practiced in various industries today. It demonstrates how humans and machines can effectively work together; more advanced tools and systems, when learned to be handled, enhancing the degree of readiness for real jobs within industries getting more digital.

CHAPTER 2

LITERATURE REVIEW

2.1 RESEARCH OF PREVIOUS STUDY

2.1.1 Aviation Industry in Malaysia

The Malaysian airline industry has grown significantly since the establishment of Malayan Airways Limited in 1947 (The Edge Malaysia, 2025). The industry is controlled by the likes of Malaysia Airlines, AirAsia, and Malindo Air in the present (Malaysia Airports Holdings Berhad, 2024). Full-service carriers and low-cost carriers fight each other tooth and nail in the industry, and this has fueled innovation in route networks, services, and pricing (The Edge Malaysia, 2025).

Consumer attitudes and behaviors have been revolutionized by AirAsia's in-your-face pricing and promotional strategies (The Edge Malaysia, 2025). Their influence has fundamentally changed how passengers view airline travel, especially regarding value for money and affordability (Malaysia Airports Holdings Berhad, 2024).

Competitiveness and safety of air transport services are regulated by the Ministry of Transport (MOT), the Malaysian Aviation Commission (MAVCOM), and the Civil Aviation Authority of Malaysia (CAAM) (Malaysia Airports Holdings Berhad, 2024). Rules and industry innovation, combined, will drive a dynamic air transport market focused on customers and sustainable development (The Edge Malaysia, 2025).

2.1.2 Composite Industry

Composite repair industry is important and one of critical aspects in repairing and maintenance and has become widely used in the aerospace, automotive, marines, construction and energy industries especially wind energy and it continuously expanding rapidly worldwide. Composite materials known as their corrosion resistance, strength to weight ratio and flexibility designation. With the increasing use of composite materials in the industry widely, it is resulting in highly demanded skilled technician.

According to CompositeLab (n.d.), composite materials have been used by the ancient Mesopotamians around 3400 B.C., when they glued wood strips at different angles to create plywood. The concept of "composite" building construction has existed since ancient times (History of Composite, n.d.). According to Sapuan (2009), composite materials had been around since the time of Pharaoh in Egypt and that time, bricks were reinforced with straw to form composite bricks. In Japan it is reported that Samurai sword was developed from composite materials.

The main advantages of composites" materials according to Campbell (2010) are their high strength and stiffness, combined with low density, when compared with bulk materials such as sand, gravel and cement, allowing for a weight reduction in the finished parts. However, composites materials have their own disadvantages which as stated by Sapuan (2009) are lack of ductility, susceptible to delamination and splitting, residual stress due to shrinkage during curing process, high cost of raw materials and possible weakness of transverse properties.

2.1.3 Composite in Aviation Industry

There are numerous applications for composite materials in our daily lives. For example, they were used to repair the skin of airplanes or other parts in the aviation industry. This type of repair procedure is known as composite repair.
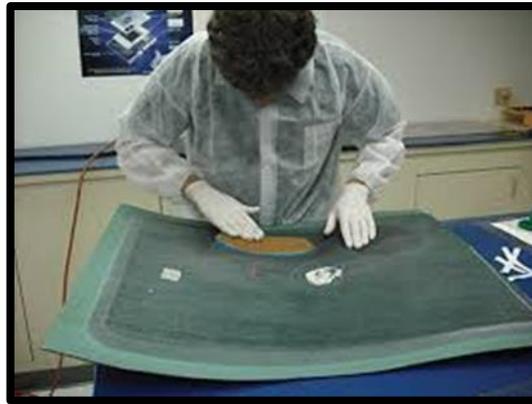
Figure 2.1.: Aircraft Composite Repair (Aviation Maintenance Magazine,2024)

Composite repair has been used for a long time for a variety of reasons. The first composite repair was used by the Royal Australia Air Force (RAAF) in the late 1970s (Avdelidis, N. P., Almond, D. P., & Busse, G. 2003). One of the reasons is that composite materials are light compared to other materials. Due to its light in weight, the fuel consumption of an aircraft can be reduced, contributing to sustainability and lower emission (HENKEL. 2022). Other than that, the strength of composite material is different compared to aluminum. It's resistant to fatigue and corrosion. Given this feature, composite parts have longer life cycles, which lowers maintenance costs and boosts aircraft dependability (Pittsburgh Institute of Aeronautics. N.d.).

Composite repair is performed by combining different types of materials. These materials can be categorized as reinforced fiber, matrix and adhesives (Pittsburgh Institute of Aeronautics. N.d.). Reinforced fiber is a material that has already been embedded in matrix material to add or enhance its properties (Reading Plastics. 2018, September 27). There are many types of reinforced fiber in our world, but the commonly used for composite repair is carbon fiber reinforced polymer (CFRP) that was strong and low in weight and fiberglass

which is not as strong as carbon fiber but strong enough to get the job done and cheaper. The other material that was used during composite repair is matrix material such as epoxy resin. It provides stability and distributes loads throughout the structure by joining the reinforcing fibers.
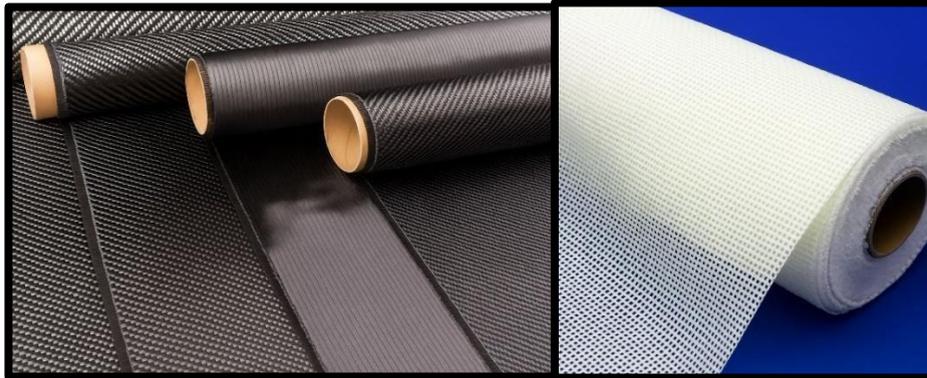
Figure 2.2: Carbon Fiber and Fiberglass

Composite repair also varies in type and method regarding the application such as bonded patch repair and bolted repair. These two techniques are different but have the same purpose. Bonded patch repair is a method that be done by gluing a composite patch in or over the damaged area (Development Center for Maintenance of Composites. 2018). Bolted repair on the other hand uses the fastener such as bolt or rivet to perform the composite repair.

2.1.4 Education Digitalization

Figure 2.3: Class Learning During MCO (straitstimes.com, .2021)

Turns out education digitalization is crucial in modern teaching and learning processes. The digital educational technology market today is in an extremely favorable ecosystem formed by the massive transition of users to online learning (D A Petrusevich 2020 J. Phys.: Conf. Ser. 1691 012223). During the pandemic of covid -19, this learning method has taken significant use as the pandemic limits all the traditional learning methods which are in class learning and this trend of learning continues even after the pandemic ended. This method of learning has been involved from as simple as online classroom to digital learning applications due to the simplicity and enhanced accessibility of it.

Digital learning has proven its demands due to its convenience and its effectiveness. It utilizes the usage of internet and IoT in its development. Additionally, digital learning has come in many types of mediums for example e-learning websites, applications and gamification. This type of method turns out effective yet interactive because students didn't need to rely on the written textbook nor class lecturing to gain a comprehension of the subject and while still 'having fun' to learn the and gaining the knowledge.

Figure 2.4: Digital Learning (neovation.com,n.d)

With the digital learning application has gaining more demand in the educational institute, this shows that digital learning will thrive and revolutionize existing teaching and learning methods. Digital learning presents better positive effects on learning motivation than traditional teaching does (Ming-Hung Lin 1, Huang-Cheng Chen 1, Kuang-Sheng Liu Tung-Fang Design Institute, n,d). It's more effective, efficient, time saving, easily accessible and keeping the students' interest in the content of the subjects.

2.2   SELECTION OF IDEA

2.2.1   Application Designing Interface

The COMPFIXED application's interface is designed to offer a clean, focused, and user-friendly digital learning experience. Utilizing a cold color scheme, such as calm neutrals, cool blues, and greys. The color of the interface produces a quiet, professional, and structured environment conducive to technical learning such as composite repair. Users may effortlessly browse between sections because of the interface's streamlined dashboard. Cold colour palettes are widely recognized for promoting concentration, clarity, and a sense of control, making them highly suitable for educational and training platforms.

Maintaining visual consistency throughout the interface is essential. Elements such as colour schemes, font types, icons, and layout structures are kept uniform to reduce user confusion and enhance usability. Cool-toned themes help minimize distractions and improve visual comfort, especially in extended use or low-light environments. Typography is selected for readability, using sans-serif fonts and high-contrast combinations to ensure clarity against the cool background. Well-chosen text colors and spacing make it easier for users to read instructions, captions, and guides without eye strain.

Icons and images are used not only for visual appeal but also to support learning content. Cold-toned design paired with minimalistic icons gives the application a modern and professional feel while keeping the focus on the educational material. By adopting a cold-themed interface, the COMPfFIXED app delivers a calm, organized, and accessible learning space that supports better user focus and engagement. This aligns well with digital learning design standards that prioritize both functionality and aesthetics.

2.2.2 Application Mechanism

The product mechanisms that will be utilized in COMPFIXED are the video simulation, infographic slides, checklist, and assessment. This allows the user to learn at their own pace and ensures study efficiency. Students can refer detailed repair processes and procedures through video simulations, which bridge the gap between theory and practical application and help users understand challenging tasks. Visual learning has been shown to improve retention and practical comprehension, especially in technical fields (Petruvich, D.A.2020 November)

The reason infographic slide is used in this application is to help students visualize and simplify content context (Das, S. 2025, February 17). Infographic slides could be made by combining images, symbols and short text. The usage of infographic slides also could increase attention and assist students in processing information quickly (Santos, A. 2024, September 26). Assessments aid in tracking learning progress and providing feedback to strengthen comprehension. Self-assessment tools and quizzes on digital platforms help learners focus better and efficiently review their weak areas, according to a study published in the Academy of Educational Leadership Journal (Yarbrough, J. R. 2019).

By tracking their progress, students can keep an eye on their own growth and establish learning objectives. This feature promotes accountability and self-paced learning, both of which enhance learner outcomes and long-term skill retention, as the same study emphasizes (Yarbrough, J. R. 2019)

2.2.3 App Development

With the growth of mobile and web-based technologies, the creation of educational applications has taken on greater significance in technical and vocational training. According to Ally and Tsinakos, mobile learning applications enhance student engagement and knowledge retention by providing interactive, accessible content.

No-code platforms, such as Jotform, have simplified app development for educational purposes. These platforms enable educators and students without a programming background to design and create functional learning tools. Jotform, specifically, supports the integration of quizzes, notes, and video tutorials, which is consistent with competency-based training and best practices in microlearning.

As a result, Jotform are the suitable platforms in development of COMPFIXED. Jotform meets the criteria for COMPFIXED development, which is drag-and-drop app builder which makes it easy and quick in development of the app. Jotform also are online update app builders, so that everyone has access to the app and can make any modification through personal desktop. Jotform provides subscription-based alternatives with a range of features and capabilities. With this flexible plan, making the Jotform is the best option in COMPFIXED developmentt
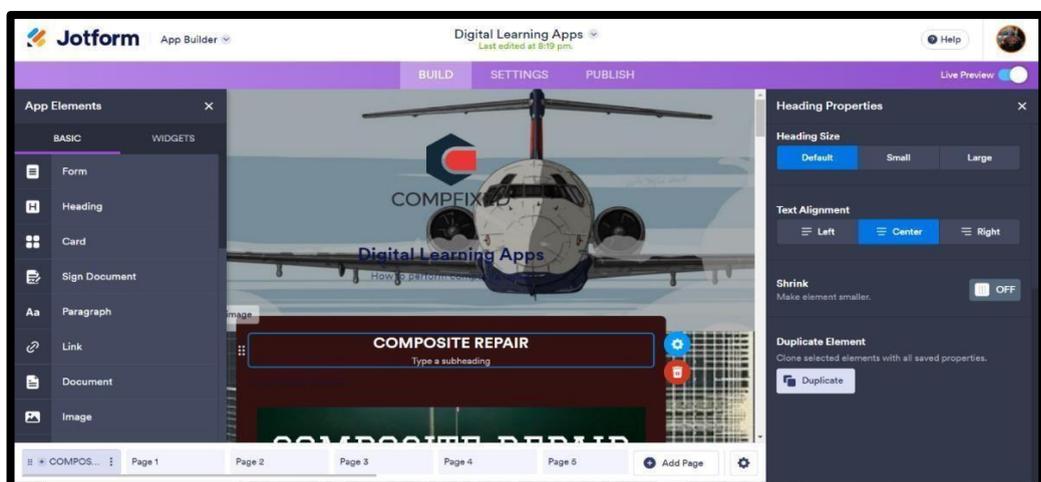
Figure 2.5: Jotform user's interface

2.2.4 Accessories & Finishing

Among accessories found in COMPFIXED are learning aid devices like headphones to experience enhanced sound quality for practicing in video simulation, and a notebook or notes application computer program wherein students may write down key points from infographic slides and checklist boxes. Convenient also is having a timer or scheduler planner so users may effectively manage time in learning in their attempts on exams and study materials.

The end product is neat and convenient to use. Video simulations have good visual and audio quality. Infographic slides are made of simple colour and readable text to study easily. Checklist and assessment are in simple viewing format, easy to use, and finish the step. The product is kept neat in appearance and works fine for everyone.

2.3   REVIEW OF RELATED PRODUCTS

2.3.1   Recent Market Products

Product A: Learn Aerospace Engineering

Table 2.1: Product A (Learn Aerospace Engineering) Description

Market Product	Product Summary
	Product Name: Learn Aerospace Engineering Developer: CODE WORLD Launch Date: Mar 5, 2023 Product Description: Learn Aerospace Engineering is an easy-to-use app that provides basic understanding of aerospace and aeronautical engineering. It includes lectures, tutorials, and notes.

Product B: SwiftComp

Table 2.2: Product B (SwiftComp) Description

No.	Market Product	Product Summary
1.		Product Name: SwiftComp Developer: Ida Yang Launch Date: May 1, 2020 Product Description: SwiftComp is a composite material simulator for computing material properties for composite materials. The app includes calculation of effective beam stiffness matrix for beam model and uses Gmsh as a mesh generator to generate mesh and images.

2.4 COMPARISON BETWEENCURRENT/RELATED MARKET PRODUCT AND CURRENT PROJECT

Table 2.3: Comparison Between Current/Related Market Product and Current Project

Products	Learn Aerospace Engineering	SwiftComp	COMPFIXED
Logo			
Purpose	Basic aerospace engineering education for beginners	Simulate and calculate the properties of composite materials.	Focused learning app for composite repair in aviation maintenance
Target	General learners, hobbyists, early engineering students	Engineers, researchers, graduate students	Aviation students & aircraft maintenance trainees
Features	• Basic aerospace notes • Lectures and tutorials	• Calculate beam stiffness matrix for beam model • Calculate coefficient of thermal expansion of thermal expansion	• Quizzes • Composite repair video simulation • Notes • 3D modelling
Learning approach	Passive learning through reading and watching content.	Technical calculations requiring user input for contents.	Active learning with multimedia content, self-assessments, and step-by-step guides.
Platform	Android and IOS	Android	Android and IOS

2.5 ENVIRONMENTAL IMPACT

One of the key eco-friendliness benefits of the COMPIXED web-based learning platform is that it allows for paperless learning. (Dillon, 2010). Traditional training methods within aircraft maintenance tend to employ the use of printed books, worksheets, and hardcopy textbooks, which are amongst the primary culprits responsible for significant paper and ink consumption. (Smith & Green, 2017). With online delivery platforms, COMPIXED bypasses the use of these conventional materials, leading to less deforestation, reduced water consumption utilized in paper production, and less waste from old or unusable printed materials. This shift online supports the aviation sector in moving towards greener, more sustainable methods in education and operations.

Furthermore, paperless learning reduces the carbon footprint associated with the production and shipping of printed study materials. (World Green Education, 2020). With all the training material, videos, and interactive sessions online, COMPIXED not only improves accessibility but also provides a greener, more efficient means of knowledge transfer. This aligns with global initiatives to reduce environmental harm and promotes a new, green model of technical training in the aviation repair business.

2.6 SAFETY CONSIDERATION

Safety is very vital while learning about composite repair, especially in aircraft. The COMPFIXED platform trains the students how to do the correct thing and observe the principle of safety in making repairs (Aviation Safety Foundation, 2018). It shows them what tools they need to use and how to handle them without accidents. The classes also include pictures and plain directions to assist the learners with the steps they need to follow in order not to make fatal mistakes. (Smith, 2019)

Even though COMPIXED is an online site, it also reminds students that they need to undergo real training as well. (World Aviation Safety, 2020) The site gives them useful knowledge to equip them before they perform repairs on aircraft. It always warns users to exercise caution and always follow safety measures. Through learning at COMPIXED students can form healthy habits that help maintain their own safety and other people's safety as they work with aircraft parts. (Safety Training International, 2017)

CHAPTER 3

RESEARCH METHODOLOGY

3.1 PRODUCT BRIEFING & RISK ASSESSMENT

This chapter outlines the essential steps completed throughout the development of the COMPFIXED digital learning application to meet the project's goals and objectives. The process involved continuous discussions with the supervisor, approval of the project direction, and verification of content accuracy based on the Boeing 737-400 Structural Repair Manual (SRM). Since this project focuses on a software-based learning platform, the risks primarily involved data accuracy, digital content reliability, and user accessibility. To mitigate these risks, all repair information was cross-checked with the SRM, and the app's interface, navigation, and learning flow were tested multiple times to ensure clarity, usability, and user safety in terms of correct procedural guidance.

3.1.1 Utilization of Polytechnic's Facilities

Although the project is software-driven, several facilities and resources provided by the Polytechnic were utilized to support the development and validation process. Permission was obtained from the supervisor and relevant coordinators to access the required spaces for discussion, testing, and evaluation activities. Polytechnic facilities used in the project are composite workshops as they are used to review actual tools and to review actual tools and repair processes related to Repair No. 9.

3.2 OVERALL PROJECT GANTT CHART

Minggu / Aktiviti Projek	M1	M2	M3	M4	M5	M6	M7	M8	M9	M10	M11	M12	M13	M14	M15	M16
PROJECT PLANNING AND SCHEDULING	███															
	███	███														
COMPOSITE REPAIR CONTENTS BEING GATHERED AND EDITED	███	███														
		███	███													
APP STRUCTURAL DESIGN MAKING (LAYOUT AND USER INTERFACE)		███	███													
			███	███												
APP DEVELOPMENT (ADDING VIDEOS, INFOGRAPHIC,QUIZ,ETC)				███	███											
				███	███	███										
FINAL FINISHING AND TESTING (FIXING BUG AND IMPROVES ANY FLAWS)						███	███									
							███	███								
PREPARATION FOR PRODUCT PRESENTATION									███	███						
										███	███					
PRODUCT PRESENTATION										███	███					
										███	███					
REPORT SUBMISSION TO SUPERVISOR AND AEROMECH PREPARATIONS (IF PARTICIPATE)												███	███			
												███	███	███		
LOGBOOK COMPLETION AND SUBMISSION														███	███	
														███	███	

Perancangan
Pelaksanaan

Figure 3.1: Overall COMPFIXED Development Gantt Chart

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3.3 FLOW CHART

3.3.1 Overall Flow Chart
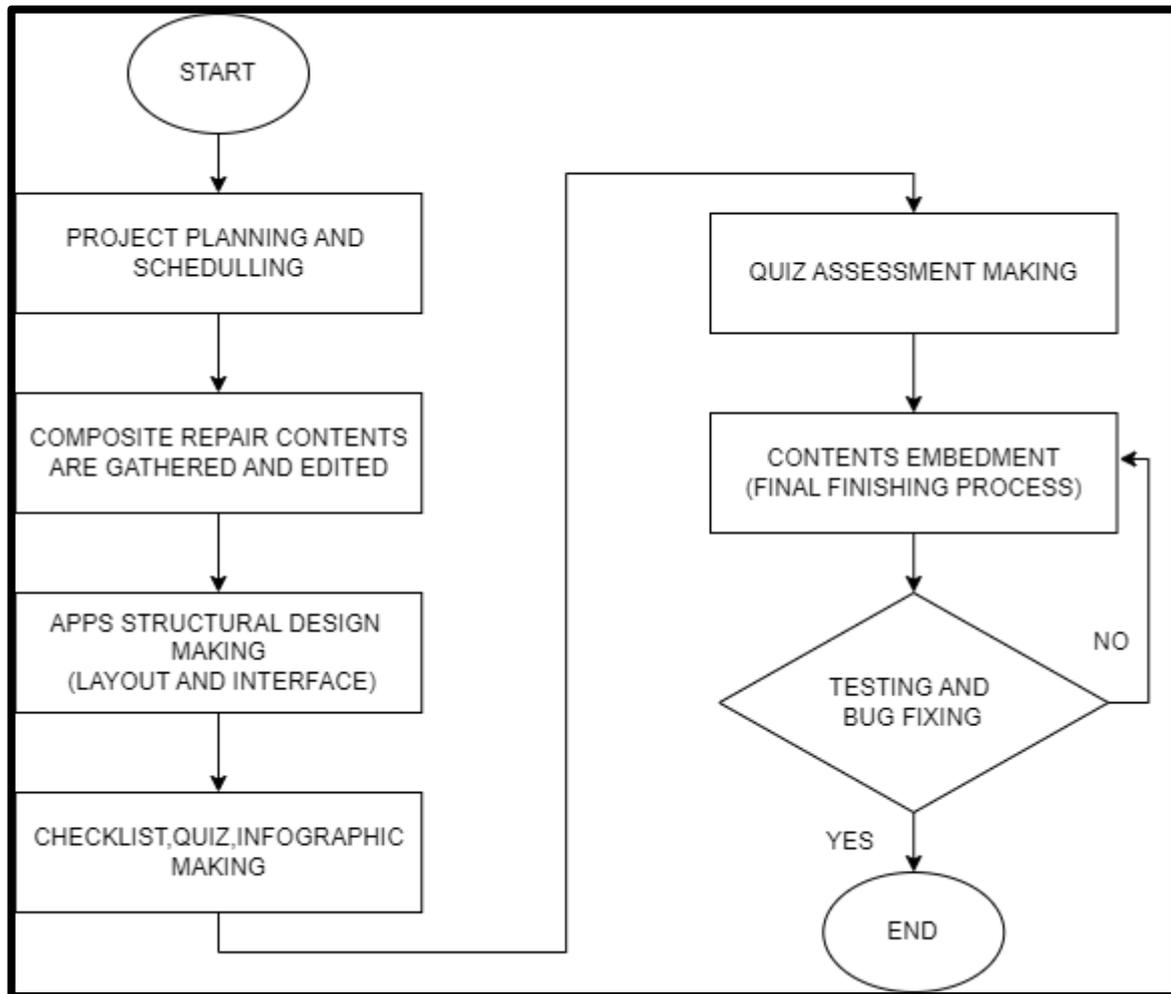
Figure 3.2: Overall Project Flow Chart

3.4 DESIGN ENGINEERING TOOLS

3.4.1 Questionnaire Survey

For better understanding, one questionnaire is created to analyze the data and collect information from the respondents. The questionnaire was filled out by 40 respondents from aviation backgrounds, and some of the key questions that aid in further analysis of the subject are as follows:
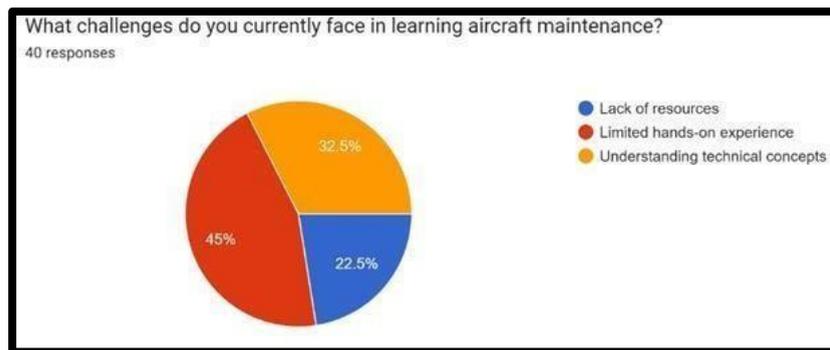
Figure 3.3: Pre-survey question 1

The first question to start with the data analysis is by asking the users what the challenges they currently face are while learning aircraft maintenance, and 45% of them say limited hands-on experience, followed by 22.5% having problems learning technical concepts and 32.5% having a lack of resources

What methods do you currently use to learn aircraft maintenance?
40 responses

- In class learning — 32 (80%)
- Real time practices — 18 (45%)
- Video learning — 19 (47.5%)
- Presentation — 13 (32.5%)
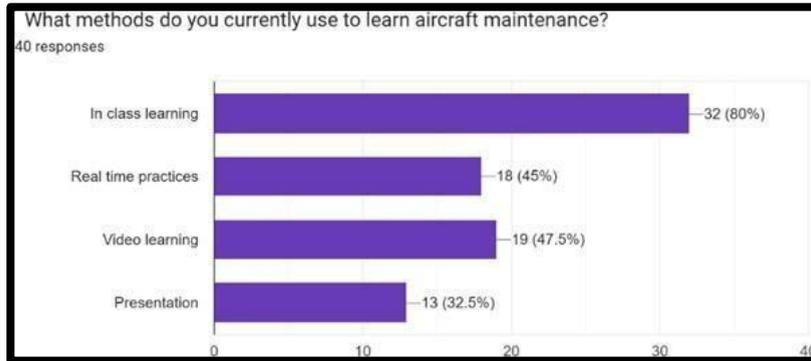
Figure 3.4: Pre-survey question 2

Then, the users are asked what method they currently use to learn aircraft maintenance, and the results shown above are:

How effective the self studies you done by yourself?
40 responses

- Very Effective
- Effective
- Moderate
- Less effective
- Not effective

50%
10%
32.5%
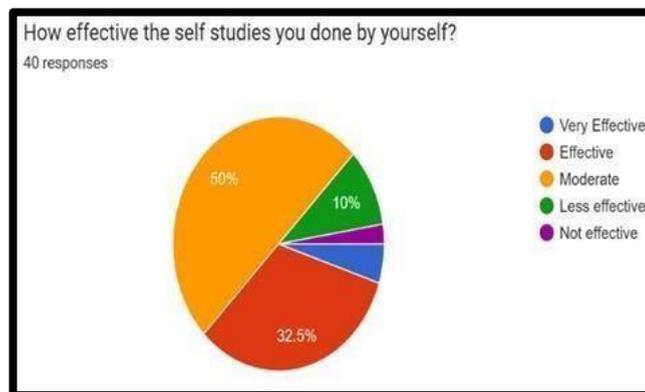
Figure 3.5: Pre-survey question 3

After that, the questionnaire is continued by asking the respondent how effective their self-studies are. The outcome is that 50% of them answered moderately. Secondly, 32% of the respondents say effective, followed by less effective at 10%. Lastly, the outcome of the survey states that 5% of our respondents pick very effective and 2.5% of them pick it not effectively
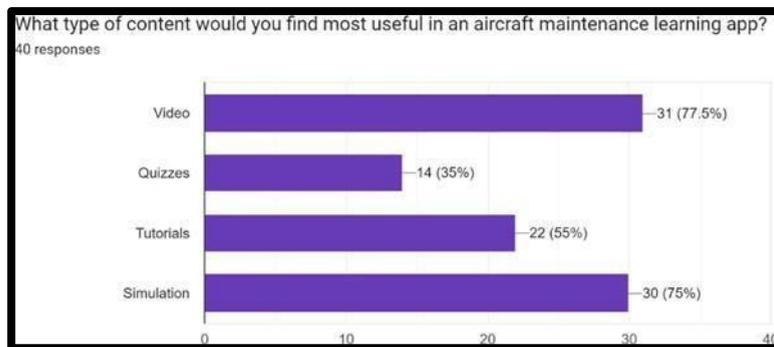
Figure 3.6: Pre-survey response 4

Not only that, but the respondent also asked what type of content they found would be most useful in an aircraft maintenance learning app. The outcome is that 77.5% of them answered video, followed by simulation at 75%. After that, 55% of the respondents picked tutorials. As for the least percentage of this question, 35% of them pick quizzes.
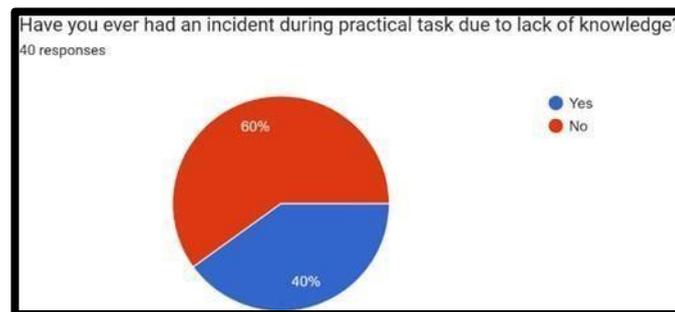
Figure 3.7: Pre-survey response 5

Additionally, the questionnaire is continued by asking the respondents if they had an incident during the practical task due to a lack of knowledge. The outcome is that 60% of them answered yes while 40% answered no.
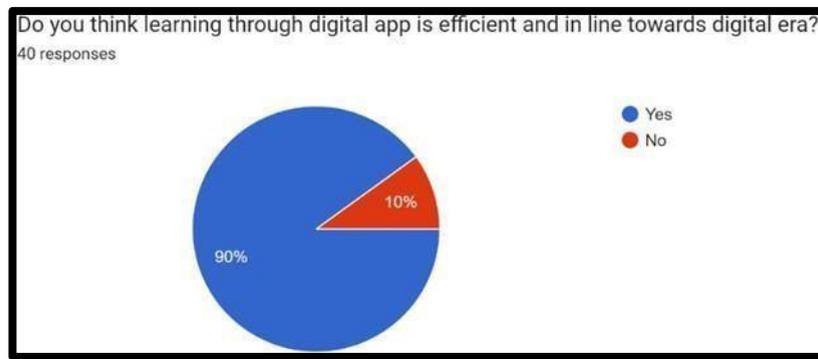
Figure 3.8: Pre-survey response 6

Lastly, the questionnaire is continued by asking the respondent if they think that learning through a digital app is efficient and in line with the digital area. The outcome that is received is that 90% of the respondents say yes, while 10% say the opposite.

3.4.2 Pareto Diagram

Table 3.1: Pareto table for COMPFIXED

Pareto Diagram: A Digital Learning App (composite Repair)				
Features	Frequency	Cummulative	Cummulative Percentage	Pareto Baseline
Delivery	32	32	31%	80%
Green Tech	32	64	62%	80%
Available	21	85	82%	80%
Technical	19	104	100%	80%
GRAND TOTAL	104			
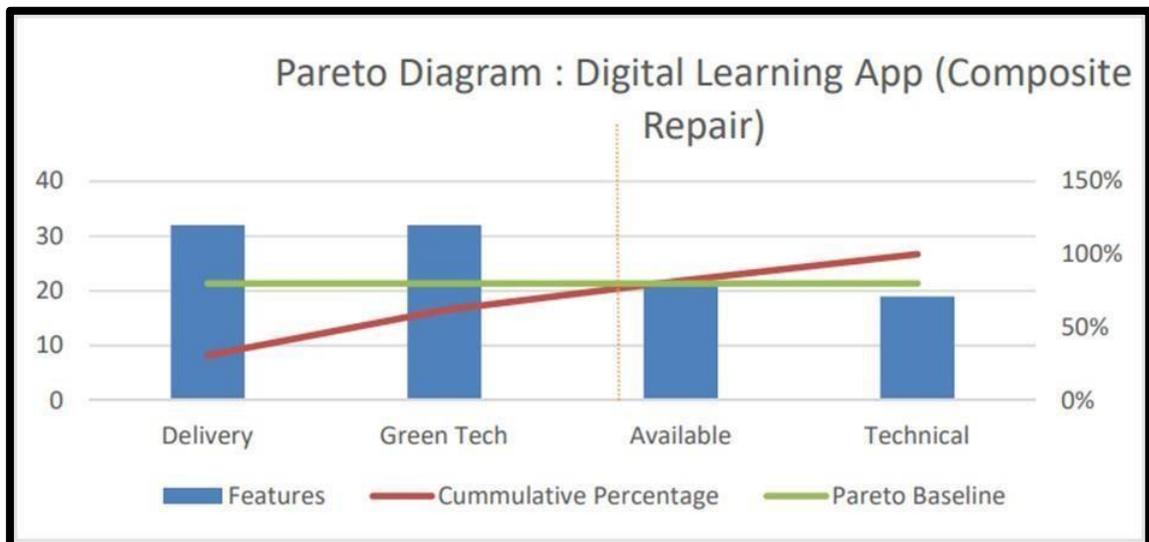
Figure 3.9: Pareto chart for COMPFIXED

Based on pareto diagram, this shows that delivery is the most demanded features from the respondent and needs to be prioritized in this digital learning application (COMPFIXED) development and the green technologies also need to be focused since it comes in second.

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3.4.3 DESIGN CONCEPTION

3.4.3.1 Function Tree
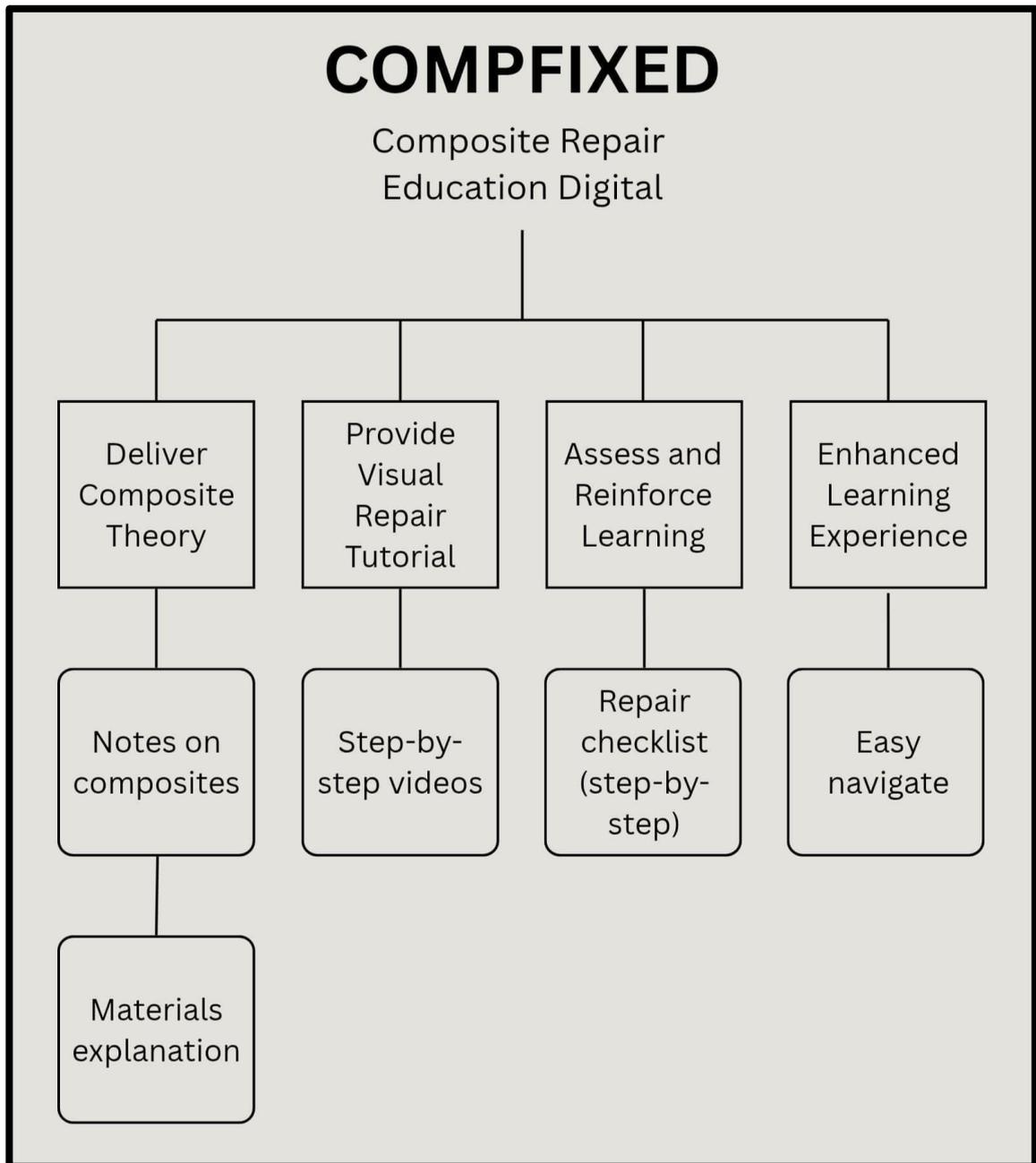
Figure 3.10: COMPFIXED Function Tree

3.4.3.2 Morphological Matrix

Table 3.2: Morphological Matrix for COMPFIXED

FEATURES	IDEA 1	IDEA 2	IDEA 3	IDEA 4
ASSESMENT MENTOD	Quizizz	Kahoot	JotForm Form Developer	Mentimeter
INTERFACE	Dark	Colourful	Dark	Dark
CONTENT SOURCES	YouTube	Self-provided	Self-provided	YouTube
CONTENT EXPLANATION	Infograhic slide	3D Modelling	Photo	Videos
SOFTWARE	Python	Appy pie	Jotform	Ruby

3.4.3.3 Proposed Design Concept 1

Table 3.3: Proposed Design Concept 1

FUNCTION	CONCEPT 1	JUSTIFICATION
ASSESMENT METHOD	Quizizz	A simple and interactive medium that make assessment more engaging with gamified elements.
INTERFACE	Dark	The dark interface provides more contrast looks to the app, making the content clearer of composite materials can be recognized easily and provide better comfy towards the eyes.
CONTENT SOURCES	YouTube	A well-known medium where anyone can easily access and make interaction process easier due to direct and simple video learning.
CONTENT EXPLANATION	Infographic slide	Providing better understanding because it guides the user step by step.
SOFTWARE	Python	Common tool to develop the app using coding and faster developing time compared to Java and C++.

3.4.3.4 Proposed Design Concept 2

Table 3.4: Proposed Design Concept 2

FUNCTION	CONCEPT 2	JUSTIFICATION
ASSESMENT METHOD	Kahoot	Easy to use, interactive interface with simple graphics and shape but student need to answer the question in fast-paced.
INTERFACE	Colourful	Colourful theme makes the application looks interactive and fun. It's can make the learning sessions more enjoyable, but the colour may not be comfortable for user's eyes.
CONTENT SOURCES	Self-provided	Using our own notes to provide the content. This method can help us to modify the content focus in the application.
CONTENT EXPLANATION	3D Modelling	3D modelling offers new era learning assessment and can entertaining students to use the application. However, the 3D modelling is quite expensive and hard to do.

SOFTWARE	Appy pie	Simple and easy to use because it is "no code" platform to develop an application. It's suitable for those who want to build full-fledged mobile application. Even so, Appy Pie is more expensive than other apps developer software and need to pay before it can be used.

3.4.3.5 Proposed Design Concept 3

Table 3.5: Proposed Design Concept 3

FUNCTION	CONCEPT 3	JUSTIFICATION
ASSESSMENT METHOD	Jotform Form Developer	Allows embedding forms directly into digital learning application
INTERFACE	Dark Theme	The dark theme interface is use as it can increase contrast making the images more visible. Other than that, it also can draw attention to important information by minimalize distractions. Dark theme interface also can reduce eye strain due to less visual stress
CONTENT SOURCES	Self-Provided	It will show originality and professionalism compared to linking or curating external resources. Other than that, it helps us focus on specific topic and information.
CONTENT EXPLANATION	Photo	Low usage of storage in the app. It also good for provide close up details and don't need much editing compared to video.
SOFTWARE	Jotform	One of the cheapest platforms to creating an app. Easy to use and simple. Provide different plan that serves difference in data uploaded

3.4.3.6 Proposed Design Concept 4

Table 3.6: Proposed Design Concept 4

FUNCTION	CONCEPT 4	JUSTIFICATION
ASSESMENT METHOD	Mentimeter	Mentimeter is a highly effective assessment tool, due to its interactive, real time and data driven approach. It enhances learning experience by engaging participants and providing instant feedback.
INTERFACE	Colourful	A colourful interface enhances user assessment, improves accessibility, and creates a more enjoyable experience, making it ideal for application, assessment and learning platform.
CONTENT SOURCES	YouTube	YouTube allows learners to access content whenever and wherever they want, making it ideal for people with busy schedules or those in different time zones.
CONTENT EXPLANATION	Videos	Video content is one of the most effective ways to deliver information, making it an essential tool for assessment, education and so on.

SOFTWARE	Ruby	This software offers simplicity, flexibility and rapid development however this software comes with certain limitations in performance and industry adoption. It is slower than other programming language too.

3.4.3.7 Proposed Final Concept

Table 3.7: Proposed Final Concept

FUNCTION	CONCEPT 4	JUSTIFICATION
ASSESMENT METHOD	Jotform Form Developer	Allows embedding forms directly into digital learning application
INTERFACE	Dark	The dark theme interface is use as it can increase contrast making the images more visible. Other than that, it also can draw attention to important information by minimizing distractions. Dark theme interface also can reduce eye strain due to less visual stress
CONTENT SOURCES	Self-Provided	Ease interaction process due to direct interface display rather than convenient button methods, user can also directly use display screen to gain information if as backup if the projector lens malfunction
CONTENT EXPLANATION	Videos	Video content is one of the most effective ways to deliver information, making it an essential tool for assessment, education and so on
SOFTWARE	Jotform	One of the cheapest platforms to creating an app. Easy to use and simple. Provide different plan that serves difference in data uploaded

3.4.4 EVALUATION & SELECTION OF CONCEPTUAL DESIGN

3.4.4.1 Pugh Matrix

Table 3.8: PUGH MATRIX: PRODUCT A (Learn Aerospace Engineering) AS DATUM

FEATURES	CONCEPT 1	CONCEPT 2	PRODUCT A	CONCEPT 3	CONCEPT 4
ASSESMENT METHOD	2	2	D	1	1
INTERFACE	1	1	A	3	1
CONTENT SOURCES	2	3	T	3	1
CONTENT EXPLANATION	1	1	U	2	3
SOFTWARE	3	2	M	1	2
TOTAL SCORE	9	9	-	10	8
RANKING					

Legend: 3(+),2(=),1(-)

Table 3.9: PUGH MATRIX: PRODUCT B (SwiftComp) AS DATUM

FEATURES	CONCEPT 1	CONCEPT 2	PRODUCT B	CONCEPT 3	CONCEPT 4
ASSESMENT METHOD	1	**2**	D	1	2
INTERFACE	2	**1**	A	1	1
CONTENT SOURCES	2	1	T	2	1
CONTENT EXPLANATION	1	**2**	U	3	2
SOFTWARE	2	1	M	1	2
TOTAL SCORE	9	7		8	8
RANKING					

Legend: 3(+),2(=),1(-)

PUGH MATRIX: PROPOSED CONCEPT AS DATUM

Table 3.10: PROPOSED CONCEPT AS DATUM

FEATURES	CONCEPT 1	CONCEPT 2	PROPOSED CONCEPT	CONCEPT 3	CONCEPT 4
ASSESSMENT METHOD	1	1	D	3	1
INTERFACE	3	1	A	3	1
CONTENT SOURCES	2	1	T	3	3
CONTENT EXPLANATION	3	1	U	1	3
SOFTWARE	1	2	M	3	1
TOTAL SCORE	10	6		13	9
RANKING					

Legend: 3(+),2(=),1(-)

\

3.4.4.2 Summary on Pugh Matrices

PUGH Matrix for each idea is needed to determine which is the best option of the features to order develop the best version of our products. The PUGH Matrix can help determine the best option simply by giving marks on each of specific design features and by looking for some other factors such as suitability, complexity and cost to develop our products.

In conclusion, the PROPOSED DESIGN CONCEPT is the highest scoring concept compared to all other learning application concepts. Therefore, we've decided to use the selected proposed design to develop our project due to several contributing factors such as cost, complexity and compatibility.

3.5 CONCEPTUAL DESIGN OF THE PROPOSED PRODUCT

The conceptual design of the proposed product, COMPFIXED, is developed with a focus on practicality, accessibility, and user experience. It combines multiple digital tools and strategies to ensure the effective delivery of composite repair education for aviation students and trainees.

Assessment Method

Jotform offers a form developer option to create an instant form. Taking advantage of that, there's no need to use another third party to create the assessment for this COMPFIXED App. Other than that, form developed using Jotform can be embedded directly without any problems. This justifies why this is the best option as its convenience and simpleness.

Interface Design
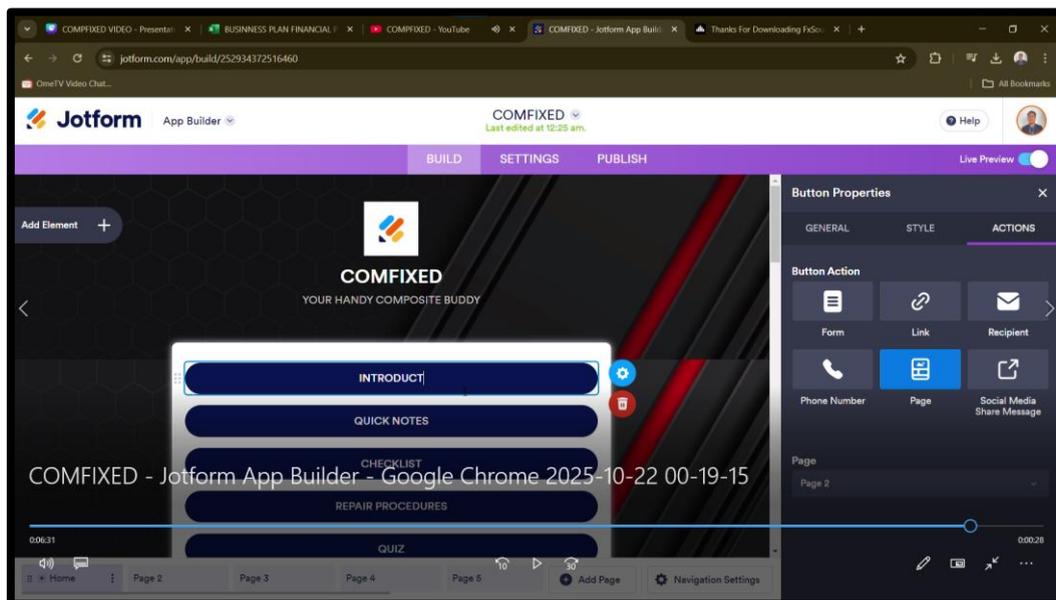
Figure 3.11: COMPFIXED User Interface Development

COMPFIXED uses a dark theme interface due for both aesthetic and functional purposes. The high contrast of this theme helps make images and instructional visuals clearer and more defined. Additionally, it reduces eye strain and fatigue, particularly with continuous use, and highlights important learning moments while minimizing distractions. This helps create a more relaxed and concentrated learning atmosphere.

Content Sources
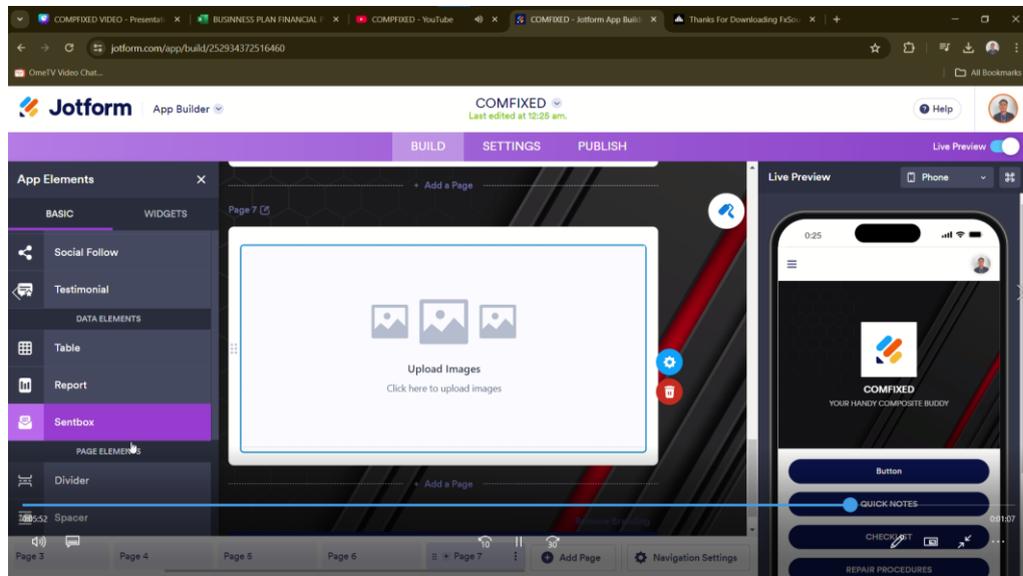
Figure 3.12: Jotform Content Embedment Process

The application relies on self-provided content, meaning that all learning materials are internally curated and uploaded by the development team or instructors. This allows greater control over the quality and relevance of the information presented. Additionally, the direct display method ensures that users can access information instantly from the interface itself, which is helpful in both learning sessions and as a backup in the event of equipment malfunction (e.g., projector failure during class).

Content Explanation Method

To enhance comprehension and retention, COMPFIXED employs video-based content as its primary form of explanation. Videos are widely regarded as an effective educational tool due to their ability to visually demonstrate procedures and concepts, which is particularly vital in a technical field such as composite repair. These visual guides allow learners to observe detailed repair processes step-by-step, bridging the gap between theoretical knowledge and practical application.

Software Platform
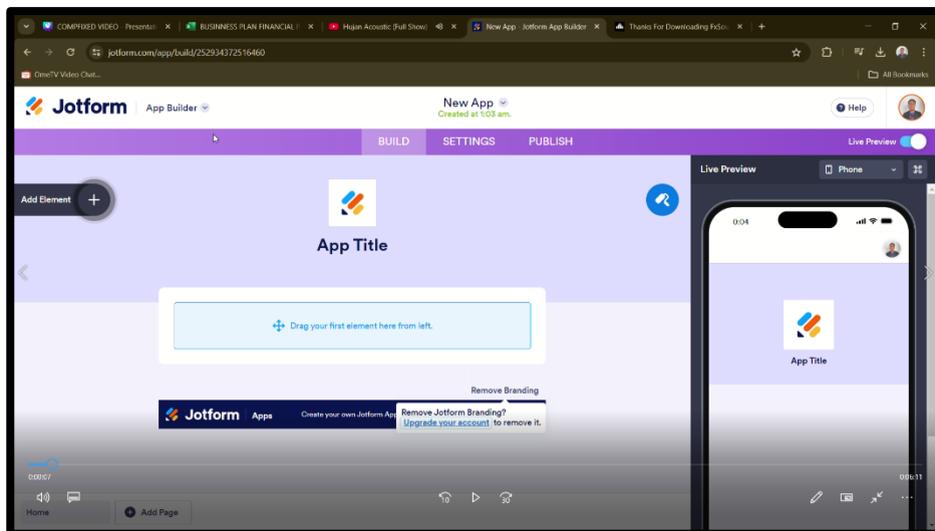
Figure 3.13: Jotform App Developer Page

The app is developed using Jotform, chosen for its affordability, user-friendly interface, and simple customization options. Jotform enables fast prototyping and deployment of functional educational tools without requiring advanced coding. Its various pricing plans accommodate different levels of data usage, making it flexible for both small-scale trials and broader implementation.

3.6 INTERFACE LAYOUT

Figure 3.14 Drafts ideas of COMPFIXED user's interface

3.7 LIST OF MATERIALS & EXPENDITURES

Table 3.11: List Of Materials & Expected Expenditures

ITEMS	UNIT	PRICE
JOTFORM	1	RM 0
CANVA	1	RM 0
TOTAL: RM 0		

CHAPTER 4

RESULTS & DISCUSSION

4.1 PRODUCT DESCRIPTION

4.1.1   General Product Features & Functionalities

In modern aircraft, most components are constructed of composite materials since they're robust, light and don't rust. Currently, most learn composite repair through classes in person or on the job. However, not everyone can attend the classes, and they may be costly or difficult to attend. To eradicate this problem, this project is going to develop an online learning platform to teach composite repair. With this app students and technicians can learn anywhere anytime. This platform contains lessons, videos and interactive content to help users learn the process in inspecting and repairing composite parts. This app will simplify learning, Make it quicker and more flexible for all.

4.1.2 SPECIFIC PART FEATURES

4.1.2.1 Product Structure

The aviation industry is a place where anything should be done perfectly and ensuring there's no mistakes and flaws involved as any simple mistake can result in a catastrophic event. Therefore, it is crucial for maintenance students and personnel to have enough exposure before carrying out any maintenance repair or procedure on real aircraft. In my institution, which is Politeknik Banting, students are supposed to be exposed to more real time repair simulation rather than in class learning that has proven not to effective.

4.1.2.2 Product Functions

The function of COMPFIXED revolves around its user by interacting with the button. There are few buttons available in the apps that serve several functions. These buttons will navigate them to pages such as introduction to composite repair, quick notes, item checklist, repair producers and quiz assessment. These buttons are already arranged in sequence to guide the user.

4.1.2.3 Software / Programming

The COMPFIXED application is fully developed by using Jotform which allows the app to run and can be used in various platforms such as mobile, tablet, and laptop. Inside the app there are several components that need to be embedded into the app such as quizzes, notes and materials checklists. The quiz in this application is developed by form builder from Jotform then it is embedded in the app.
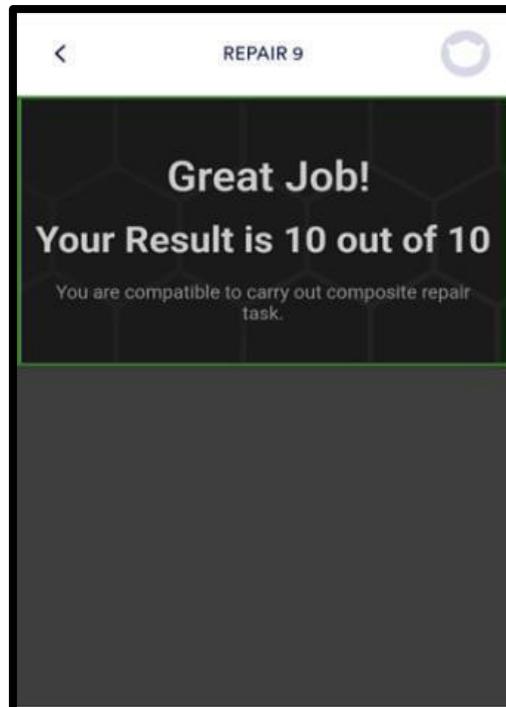

Figure 4.1: Quiz Assessment Results Page

The quiz in this app is programmed to calculate the result automatically and show the result and feedback after quiz submission. This feature can help users to know their performance level.

4.1.2.4 Accessories & Finishing

Final stage of the COMPFIXED app development Accessories and Finishing: In this phase, the overall design was polished to deliver a full-fledge platform. The interface was improved with appropriate looking icons, uniform color scheme and clean, logical look. Small tweaks were also made to enhance button placement, text legibility and for form navigation which makes use of the app easier. Functional testing serves to ensure the function of key features, including offline data collection, form identification and information storage. Errors and glitches found while testing were eliminated to further improve the system's stability and reliability. These finishing stages made sure COMPFIXED ended up a polished final that corresponds with the aims of any project and is ready to use for practical uses.

4.1.3 GENERAL OPERATION OF THE APPS

The product is a steppingstone for students to learn new skills which is composite repair without attending physical classes. Students can use this product anywhere and anytime. This product will include video simulation that will show the procedure of composite repair step by step. The video simulation will be the main guidance for students as it is easy to understand and can provide vision and movement. Other than that, the product will be equipped with infographic notes for the students to read the important points and extra information. Lastly, to ensure students are eligible and prepared to perform the composite repair, an assessment method will be added in this app.

4.1.4 OPERATION OF THE SPECIFIC PART OF THE PRODUCTS

4.1.4.1 Product Structure

COMPFIXED is a user-friendly learning tool app, and it is not that hard to navigate through the app and look for a certain topic by merely using the search button. Just like in other apps, it also shows learning progress and control of learning by the user since the booked content will be available in offline mode after downloading, it also has quiz notification features. Inside, it is quite cozy to view with information and features like colour codes and readable fonts. The features include smooth button distribution and functionality, as well as animations that make it concise but memorable. Videos are highly clear, and images and notes are quite readable. One can use it even on tablets and mobiles, and thus people can use the application to gain knowledge anywhere and anytime, along with their data being safe with these secure logins

4.1.4.2 Specific Product Functions

When a user uses our app, the first feature that they will see is a button that will take them to an introduction to composite repair page which is type of reinforced plastic. The moment they click the type of reinforced plastic button, they will see three types of reinforced plastic button, which glass fiber reinforced plastic ,5656 carbon fiber reinforced plastic and aramid fiber reinforced plastic. Each button will navigate them to three different pages that contain infographic about each type. The second features in the app are quick note button. When this button is clicked, the user will see a slide about Repair 9 which is damage to fastener hole with laminating resin and chopped fiber. The next feature is the item checklist button. This feature is to ensure that students have all the tools and materials needed for repair 9 before performing the repair task. Students must ensure that they have verified all the materials in the checklist or else they'll be unable to submit and proceed to the next step. After that, the key feature in the app is repair procedures which are step by step repair procedures via videos. The last feature in the app is a quiz assessment and students must score at least 80% to make them eligible to perform the task

4.1.4.3 Software / Programming

COMPQUIZ is one of the features in COMPFIXED that provides a quiz for measuring the knowledge of the users thus determining whether they are compatible to perform the composite repair or not. COMPQUIZ has been programmed under two conditions to determine user's results. If the user's marks pass 80% of the questions, the programmed result will direct to the page that states the user are past the test and compatible to perform the composite repair.
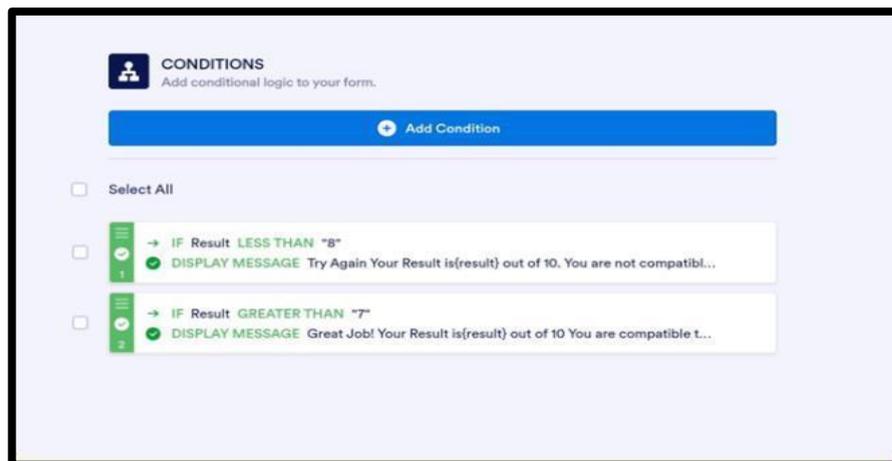
Figure 4.2: Quiz Setting Page

4.1.4.4 Accessories and Finishing

Improvement Action carried out Performance and user interaction. In the operational stage of the specific part of COMPFIXED, the accessories and finishing process were carried out to ensure high-performance and surliness. For instance, functional accessories such as navigation buttons, status indicators, and input validations were applied to allow accurate data processing. Visual elements, such as suitable icons and color schemas, were used to enhance clarity and guide users during performances. The offline operation was also adjusted to ensure that the system could continue its functionality without utilizing an internet connection through HTML-based run-time.

End testing was performed to confirm that all elements within the respective operational segments operated well and produced accurate outputs. Such finishing touches enabled stable, responsive, and user-friendly operation to ensure that COMPFIXED delivers consistent performance as per the project objectives.

4.2 Analysis Problem Encountered and Solution

During the development of COMPFIXED there were some problems that we encountered. The first problem is at the quiz assessment page, which is there's a white that appeared at the bottom of the page and can't be deleted. However, the white box does not affect the functionalities of the quiz but disrupted the visual design and interface layout. To overcome this, user is allowed to save the quiz as draft ensuring smooth operation.

Figure 4.3: Whitebox error on quiz page

The last problem we encountered, the app can't be operated in offline mode. Since COMPFIXED were developed using web-based platform which is JotForm. Users need internet connection to access the app. Therefore, we have come up with solution which is, users can open the app via web and then save them as html file. This method allows users access the content from the app without using internet connection

4.3 POST-SURVEY QUESTIONNAIRE

A post-survey was conducted among 32 Semester 3 students who completed Repair No. 9 as part of their practical assessment to evaluate the effectiveness of the COMPFIXED application after actual use. The survey collected feedback on their understanding, readiness, and confidence in performing the composite repair steps.

Figure 4.4: Post-survey response 1

Based on the data obtained, COMPFIXED gain a rating of 4.19 out of 5 for easy to use and simplicity.
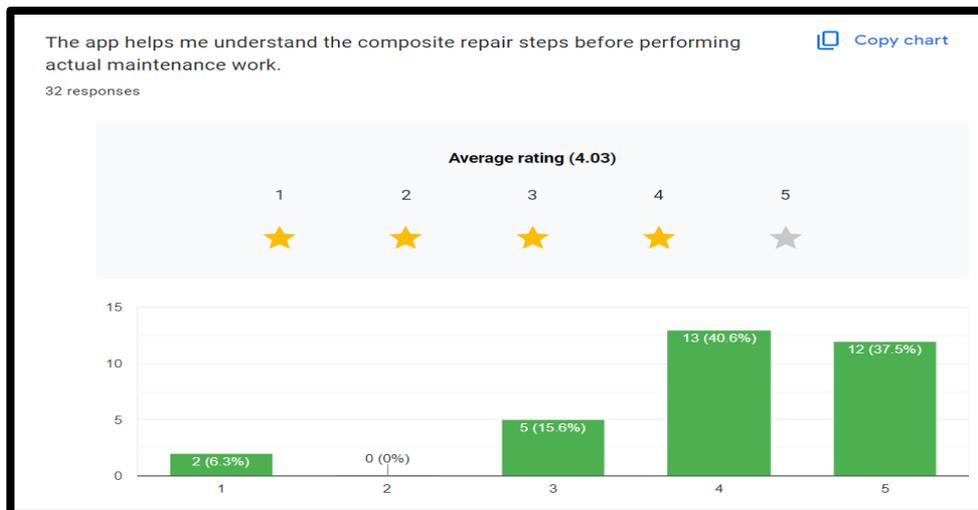
Figure 4.5: Post-survey response 2

COMPFIXED received average 4.03 rating from users that understood repair steps before performing actual tasks.

Figure 4.6: Post-survey response 3

Most of the uses rate COMPFIXED to support green and paperless approach with 4.38 out of 5 average ratings.

Figure 4.7: Post-survey response 4

Finally with average ratings of 4.13, COMPFIXED stated to enhance confident and readiness of users to perform real composite repair tasks.

CHAPTER 5

CONCLUSION AND RECCOMENDATION

5.1 GENERAL ACHIEVEMENT OF THE PROJECT

Our project, COMPFIXED digital learning application, has successfully achieved its aim and main objectives. By using JotForm as developing platform, this application provide users with a clean and user-friendly interface that provide a straightforward learning materials that have been included on the home screen of the app, such as instant repair modules, checklist of material used to ensure all item need is complete and also quiz assessment to test the understanding of student. This would help aviation students gain essential knowledge and proper skills before tackling composite repair tasks. This app can be accessed anytime and anywhere with internet connection, making the usage of paper reduced and demonstrates how the potential of technology-based learning tools specifically on composite repair can be implemented.

5.1.1 Specific Achievement of Project Objectives

5.1.1.1 Product Structure

COMPFIXED objectives to provide users, especially aircraft maintenance student with a digital learning application that improves students understanding and enhance their readiness before engaging in real maintenance tasks such as composite repair. To achieve this, we had identified students' problems using conducted surveys and developed the COMPFIXED with a user-friendly interface and straightforward learning materials that can be accessed on the home screen of the apps.

5.1.1.2 Accessories and Finishing

With a clean, neat and friendly user interface design, COMPFIXED has improved the experience of its users to learn composite repair. With implemented designs such as clear element button, dark theme background and organized content sequence making sure students can directly access and understand each content in proper sequence before executing the composite repair.

5.2 CONTRIBUTION OR IMPACT OF THE PRODUCT

COMPFIXED apps has contributed several impacts especially for aircraft maintenance students to help them gain essential knowledge, improve safety awareness and enhance their confidences level before doing real hand-on composite repair. Next, our product also reduces need to print notes and support green technology through digital learning. Lastly, the implementation of our product will enhance the readiness for modern, digital-based aviation industry.

5.3 IMPROVEMENT AND SUGGESTION FOR FUTURE STUDIES

5.3.1 Product Mechanism

The main improvement from our application mechanism is to add more repair modules to the application. The added module also needs to be latest revision Structural Repair Manual and needs to be included in all buttons feature which is inside the quick notes, checklist, repair procedure videos and its own quiz assessment. This more content variation will help students tackle more types of repairs in the future.

5.3.3 Software / Programming

COMPFIXED application can only work if there is internet connection. This limitation causes apps can't be operated if students lose the internet connection or in emergency circumstances. Therefore, more research and development need to be done to make our app can be operated if user is offline.

5.3.4 Accessories and Finishing

To make this application more advanced, addition of AI chatbot can really be helpful as it will assist the user to navigate through the entire app and find specific content they want more easily and effortlessly.

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APPENDIX A: DECLARATION OF TASK SEGREGATION

SUB-CHAPTERS	DESCRIPTION
ILHAM WAHYUDI BIN SUKINO	
1.2	Problem Statement
1.3.2.1	Specific Individual Project Objective: Product Structure
1.4.2.1	Specific Individual Scope: Product Structure
1.5	Project Impact
2.2.1	Product Designing Interface (Layout and Structure)
2.3.1	Review of Related Products – Product A (Learning App Interface)
2.4	Comparison Between Market Products and Current Project
3.1	Project Briefing & Risk Assessments
3.4.3.7	Proposed Final Concept (App Structure)
3.5	Conceptual Design of Proposed Product (App Layout)
3.6	Interface Layout
3.7.1	Overall Flow Chart
4.1.2.1	Specific Part Features: Product Structure
4.1.4.1	Operation of Specific Parts: Product Structure
5.1.2.1	Specific Achievement of Project Objectives: Product Structure
5.2	Contribution or Impact of Product (Structure Contribution)
MUHAMMAD NABIL BIN MOHD NAJIB	
1.3.2.3	Specific Individual Project Objective: Software / Programming
1.4.2.3	Specific Individual Scope: Software / Programming
2.2.3	App Development
2.3.1	Review of Related Products – Product B (Learning App Software)

3.4.4	Evaluation & Selection of Conceptual Design (Functionality)
3.3.1	Overall Flow Chart
3.8	Product Features & Functionalities (System Operation)
4.1.2.3	Specific Part Features: Software / Programming
4.1.4.3	Operation of Specific Part: Software / Programming
5.1.2.2	Specific Achievement of Project Objectives: Software / Programming
5.3.3	Improvement and Suggestion: Software / Programming

AHMAD ADHAM IMAN BIN AHMAD FITTERI

1.3.2.2	Specific Individual Project Objective: Product Mechanism
1.4.2.2	Specific Individual Scope: Product Mechanism
2.2.2	Product Mechanism
3.4	Design Engineering Tools
3.4.3	Design Conception (Function Tree, Morphological Matrix)
3.4.4.1	Pugh Matrix
3.5	Conceptual Design of Proposed Product (Mechanism)
4.1.2.2	Specific Part Features: Product Functions
4.1.4.2	Operation of Specific Parts: Product Functions
5.1.2.2	Specific Achievement of Project Objectives: Product Mechanism
5.3.1	Improvement and Suggestion: Product Mechanism

SHANJEV KUMAR A/L SUBRAMANIAM

1.3.2.4	Specific Individual Project Objective: Accessories & Finishing
1.4.2.4	Specific Individual Scope: Accessories & Finishing
2.2.4	Accessories & Finishing
3.4.3.7	Proposed Final Concept (Accessories & Finishing)
3.6	Interface Layout (Visual & Finishing Aspect)
3.7	Product Features & Functionalities (UI Finishing)

4.1.2.4	Specific Part Features: Accessories & Finishing
4.1.4.4	Operation of Specific Parts: Accessories & Finishing
5.1.2.4	Specific Achievement of Project Objectives: Accessories & Finishing
5.3.4	Improvement and Suggestion: Accessories & Finishing

APPENDIX B: SUMMARY OF SIMILARITY REPORT (TURNITIN)

COMPFIXED FINAL THESIS .pdf

by Ilham Wahyudi

Submission date: 17-Nov-2025 02:27PM (UTC+0800)
Submission ID: 2817820070
File name: COMPFIXED_FINAL_THESIS_OTW_SIAP_.pdf (2.22M)
Word count: 11534
Character count: 62829

COMPFIXED FINAL THESIS .pdf

APPENDIX C: PRE-SURVEY FORM

Technical - Development of Digital Learning Application on Aircraft Maintenance Composite Repair

What challenges do you currently face in learning aircraft maintenance?
45 responses

- Lack of resources
- Limited hands-on experience
- Understanding technical concepts

33.3%
44.4%
22.2%

Copy chart

Copy chart

What methods do you currently use to learn aircraft maintenance?
45 responses

In class learning — 36 (80%)
Real time practices — 20 (44.4%)
Video learning — 21 (46.7%)
Presentation — 15 (33.3%)

What digital device are you frequently use right now?
45 responses

Copy chart

- Mobile phone
- Desktop
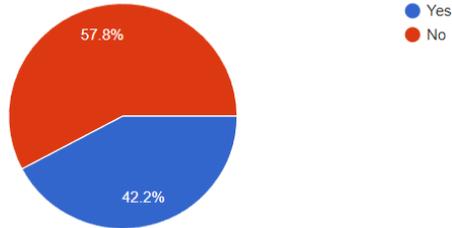- Sometimes I use laptop to gather more Information

80%
17.8%

Delivery & Availability - Development of Digital Learning Application on Aircraft Maintenance Composite Repair

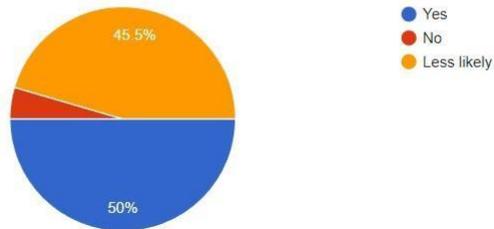Have you used any learning application for aircraft maintenance?

45 responses

Copy chart

- Yes
- No

57.8%

42.2%

Are you able to find all the information that needed about aircraft maintenance on the Internet?

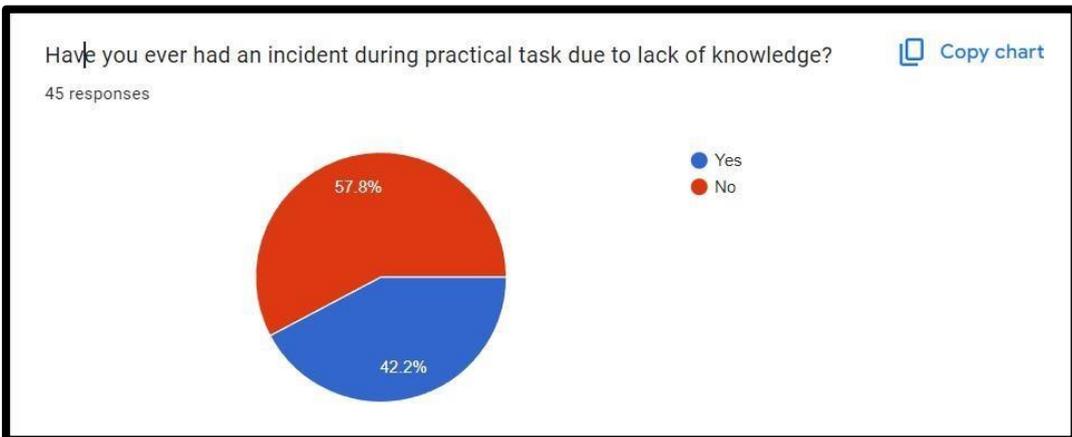44 responses

Copy chart

- Yes
- No
- Less likely

45.5%

50%

How effective the self studies you done by yourself?

45 responses

Copy chart

- Very Effective
- Effective
- Moderate
- Less effective
- Not effective

53.3%

8.9%

31.1%

How many hours you spend to do self learning ?

45 responses

- Less than 30 minutes
- 1 - 2 hours
- More than 2 hours

44.4% / 33.3% / 22.2%

Copy chart

What type of content would you find most useful in an aircraft maintenance learning app?

45 responses

Video — 33 (73.3%)
Quizzes — 16 (35.6%)
Tutorials — 24 (53.3%)
Simulation — 31 (68.9%)

Copy chart

Have you ever had an incident during practical task due to lack of knowledge?

45 responses

- Yes
- No

57.8% / 42.2%

Copy chart

On which platform would you prefer to access the app?

45 responses

- ● Mobile phone
- ● Desktop
- ● Laptop

20%

77.8%
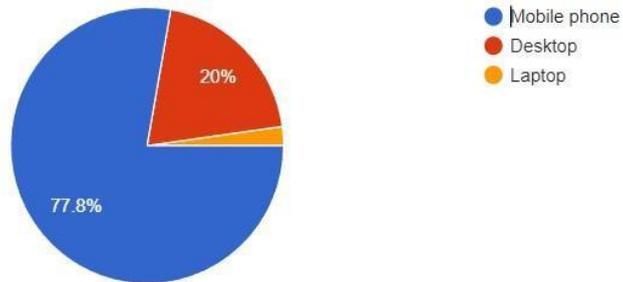
Copy chart

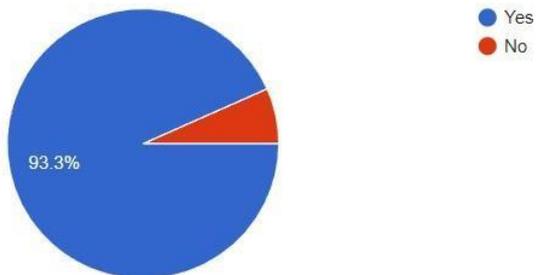**Do you think digital learning application would be benificial for aircraft maintenance understanding?**

45 responses

- ● Yes
- ● No

93.3%

Copy chart

How would you prefer the application to work?

45 responses

- ● Online
- ● Offline
- ● Both

68.9%

20%

11.1%
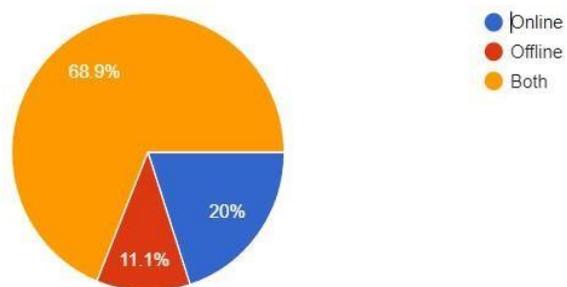
Copy chart

Green technology - Development of Digital Learning Application on Aircraft Maintenance Composite Repair

Have you ever spend resources to print notes for educational purposes on carrying out maintenance?

43 responses

- Yes
- No

23.3%

76.7%
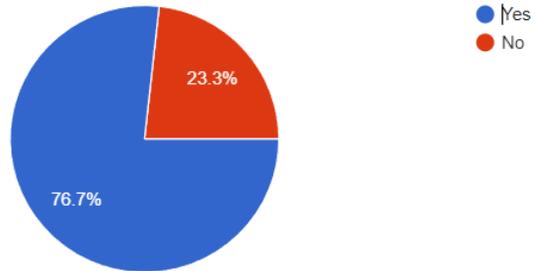
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Do you think, it is important to have up to date resources when performing aircraft maintenance?

44 responses

- Yes
- No

97.7%
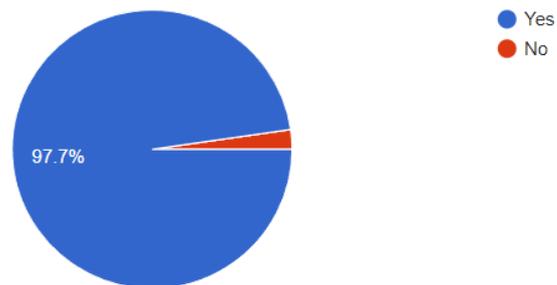
Copy chart

Do you think learning through digital app is efficient and in line towards digital era?

43 responses

- Yes
- No

9.3%

90.7%
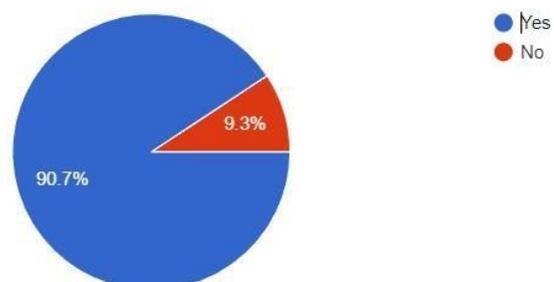
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APPENDIX D: POST-SURVEY FORM

The COMPFIXED application is easy to use and simple to understand.

□ Copy chart

32 responses

Average rating (4.19)

1	2	3	4	5
★	★	★	★	★

- 1: 0 (0%)
- 2: 2 (6.3%)
- 3: 2 (6.3%)
- 4: 16 (50%)
- 5: 12 (37.5%)

The app's design and layout make learning easier and more engaging.

□ Copy chart

32 responses

Average rating (4.25)

1	2	3	4	5
★	★	★	★	★

- 1: 0 (0%)
- 2: 1 (3.1%)
- 3: 5 (15.6%)
- 4: 11 (34.4%)
- 5: 15 (46.9%)

The app reduces the need for printed materials during learning.

32 responses

Average rating (4.34)

	1	2	3	4	5
	★	★	★	★	☆

- 1: 0 (0%)
- 2: 0 (0%)
- 3: 2 (6.3%)
- 4: 17 (53.1%)
- 5: 13 (40.6%)

Using digital learning through COMPFIXED supports green and paperless learning practices.

32 responses

Average rating (4.38)

	1	2	3	4	5
	★	★	★	★	☆

- 1: 0 (0%)
- 2: 0 (0%)
- 3: 4 (12.5%)
- 4: 12 (37.5%)
- 5: 16 (50%)

The app helps me understand the composite repair steps before performing actual maintenance work.

32 responses

Average rating (4.03)

1	2	3	4	5
★	★	★	★	★

Rating	Count
1	2 (6.3%)
2	0 (0%)
3	5 (15.6%)
4	13 (40.6%)
5	12 (37.5%)

After using COMPFIXED, I feel more confident and prepared to perform real composite repair tasks.

32 responses

Average rating (4.13)

1	2	3	4	5
★	★	★	★	★

Rating	Count
1	1 (3.1%)
2	1 (3.1%)
3	4 (12.5%)
4	13 (40.6%)
5	13 (40.6%)

1 of 2,006 ...IG PURPOSE ONLY

CHAPTER
51

STRUCTURES - GENERAL

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REPAIR 9 - REPAIR OF DAMAGE TO A FASTENER HOLE WITH LAMINATING RESIN AND CHOPPED FIBER

1. **Applicability**

   ⚠️ **WARNING**　MAKE SURE THAT FLIGHT CONTROL SURFACES ARE CORRECTLY BALANCED AFTER THEY ARE REPAIRED. IF YOU DO NOT OBEY, FLUTTER CAN OCCUR AND THE RESULT CAN BE A STRUCTURAL FAILURE.

   ⚠️ **CAUTION**　REFER TO THE SPECIFIED COMPONENT REPAIR SUBJECT FOR THE MATERIALS AND PROCEDURES APPROVED FOR THIS REPAIR. IF YOU DO NOT OBEY, THE REPAIR CAN BE UNSATISFACTORY.

   A. Repair 9 is a typical repair that is applicable to damage to a fastener hole.

   B. Repair 9 can be used to repair a fastener hole that does not align with the mating structure.

   C. Repair 9 is not applicable to radomes, floor panels, and to all thrust reverser components except as given in 54-30-01, Repair 4 for the thrust reverser blocker door panels. Refer to 53-10-72 for radomes, 53-00-50 for floor panels, and 54-30-01 for the thrust reverser.

2. **General**

   A. Repair 9 is a Category A damage tolerant repair. Refer to 51-00-06 for the definitions of the different categories of repairs.

   B. Refer to Repair 9 - Layout of the Repair Parts, Figure 201/REPAIR 9 for the layout of the repair parts.

3. **References**

Reference	Title
51-00-06	STRUCTURAL REPAIR DEFINITIONS
51-40-02	FASTENER INSTALLATION AND REMOVAL
51-60-00	CONTROL SURFACE BALANCING
53-00-50	FUSELAGE FLOOR PANELS
53-10-72	FUSELAGE NOSE RADOME - SECTION 41
54-30-01	FAN THRUST REVERSER COWL SKIN

4. **Repair Instructions**

   A. Find the limits of the damage. Refer to Paragraph 4.A./REPAIR GENERAL.

   B. Remove all contamination and water from the damaged area as given in Paragraph 4.D./REPAIR GENERAL. Make sure the repair area is fully dry.

   C. Clean the repair surfaces as given in Paragraph 4.E./REPAIR GENERAL.

   D. Make a mixture of laminating resin and chopped fibers. Use 1 part by weight of laminating resin to 1 part by weight of chopped fibers. Refer to Repair General, Tables 202 and 203 for the repair materials.

   NOTE: Use carbon fibers for carbon or hybrid structure. Use glass fibers for glass structure.

   E. Fill the hole equal to or slightly more than the adjacent surface contour with the laminating resin and chopped fibers.


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737-800
STRUCTURAL REPAIR MANUAL

   F. Cure the laminating resin as given in Figure 214/REPAIR GENERAL. A vacuum is not necessary for this step.

   G. Make the surface contour of the repair equal to the initial surface contour around the repair to + 0.010 inch with No. 150-grit or smaller abrasive paper.

   NOTE: Use a 0.010 inch thick aluminum template to give protection to the area around the repair when you use abrasive paper.

   ⚠️ **CAUTION**　DO NOT SAND THE FIBERS OF THE INITIAL SURFACE AROUND THE REPAIR. IF YOU DO NOT OBEY, YOU CAN CAUSE MORE DAMAGE TO THE COMPONENT.

   H. Make the surface around the repair rough with No. 150-grit or smaller abrasive paper.

   I. Clean the repair area as given in Paragraph 4.E.(4)/REPAIR GENERAL.

   J. Prepare and apply the fabric repair plies as given in Paragraph 4.L./REPAIR GENERAL.

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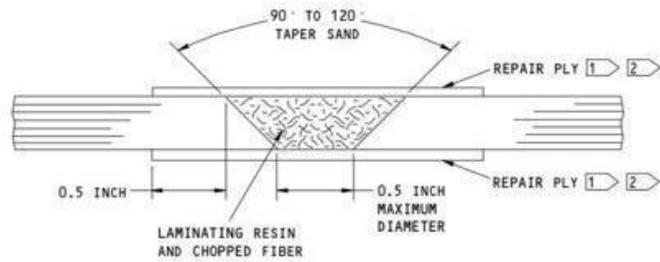
NOTES

1 ▷ PREPARE AND INSTALL ONE PLY OF BMS 9-3, TYPE H2 OR H3 GLASS FABRIC AS GIVEN IN REPAIR GENERAL, PARAGRAPH 4.

2 ▷ THIS PLY IS NOT NECESSARY IF THE HOLE IS COVERED BY A DIFFERENT REPAIR.

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Repair 9 - Layout of the Repair Parts
Figure 201

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