

***Design of E-Module Practicum  
En-Route Flight Information (EFI) Course with the Rapid Application  
Development (RAD) Model at Aviation Polytechnic of Surabaya***

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**Abstract**

En-Route Flight Information (EFI) is one of the courses in the Diploma 3 Aeronautical Communication Study Program which studies the procedures for guiding aircraft in class G airspace. Based on Annex 11 Air Traffic Service, class G airspace provides flight traffic services for IFR and VFR flights, where the services provided are Flight Information Service and Emergency Service (Alerting Service) [1]. Flight Information Service is a service performed by providing news and information that is useful and beneficial for safety, security and efficiency for flights. Alerting Service is a service performed by notifying the appropriate relevant agencies, regarding aircraft that require the help of search and rescue units and assisting these agencies, if needed. This research uses the Research and Development method with the Rapid Application Development (RAD) Model with qualitative data analysis techniques and written Interview testing techniques with Material Experts and Media Experts using questionnaires. The objectives of this research are 1) To design an E-Module Design product En-Route Flight Information (EFI) with the Rapid Application Development (RAD) Model at the Aviation Polytechnic of Surabaya which can be used as learning on the Learning Management System (LMS) at the Aviation Polytechnic of Surabaya. The result of this research is a learning using E-Module Practicum En-Route Flight Information (EFI) in the form of flipbooks and mastery tests and discussions equipped with video and audio images that have been adjusted to the "Rencana Pembelajaran Semester" (RPS). Then the final result of an E-Module Practicum En-Route Flight Information (EFI) is implemented on the Learning Management System (LMS) of the Aviation Polytechnic of Surabaya.

**Keywords:** E-Modules, Module Electronics, En-Route Flight Information (EFI), Learning Management System (LMS).

**INTRODUCTION**

Aviation safety is a major factor in every flight operation, in creating safety, security and smooth flight traffic, it requires learning that can support human resources in carrying out flight operations. The Aeronautical Communication Study Program is one of the study programs at the Aviation Polytechnic of Surabaya, in accordance with the Regulation of the Head of the Transportation Human Resources Development Agency on the Curriculum for the Education and Training Program for Formation in the Aviation Sector. The Aviation Communication Study Program has 2 (two) "work expertise courses", including Aerodrome Flight Information Service (AFIS), En-Route Flight Information (EFI) and Aeronautical Fixed Telecommunication Network (AFTN) [2]. With these courses, it is expected that graduates are ready to become

qualified aviation personnel who are responsible for their duties and obligations and can maintain and maintain safety, security and smoothness in flight traffic.

En-Route Flight Information (EFI) is a course that studies the procedures for guiding aircraft in uncontrolled airspace. In field application, En-Route Flight Information (EFI) has 2 services, namely Flight Information Service and Emergency Service (Alerting Service). In providing these services, Flight Communication Personnel are required not only to be able to learn theory but must be able and have expertise in practicum learning which can later be applied in the field to provide maximum service according to International Civil Aviation Organization (ICAO) standards [1].

Currently, the En-Route Flight Information (EFI) Course does not have learning media in the form of

modules or guidelines that can be used in practicum learning, so that cadets have difficulty understanding how to provide services to En-Route Flight Information (EFI). Therefore, to support the practicum learning of the En-Route Flight Information (EFI) course, a medium is needed that can be a guide for cadets to carry out practicum learning on the Aviation Polytechnic Surabaya campus, as well as a guide in providing an overview of procedures, tools and situations in field conditions [2].

In the industrial revolution 4.0 is the application of artificial intelligence or Artificial Intelligence (AI) which has the potential to improve the quality of life of the world community [3] [4]. With the increasingly sophisticated technology, it is also easier to make the learning process fun and interesting, which utilizes technology. E-Module or electronic module is an electronic version of a module designed with the necessary software as a tool or means of learning that contains material, methods, limitations and ways of evaluating which are systematically designed and attractive to achieve an expected competency according to the level of complexity electronically.

Based on the above problems to meet flight safety and fulfillment of practicum learning support in the En-Route Flight Information (EFI) course, it can be concluded to design an E-Module. The E-Module will be used as a practicum guide for En-Route Flight Information (EFI) at Surabaya Aviation Polytechnic, which will be developed using the Rapid Application Development (RAD) model and implemented by utilizing technology to create a fun and interesting learning process. Later the E-Module will be incorporated into the Learning Management System (LMS) with Content Management System (CMS) content using Moodle programming at the Surabaya Aviation Polytechnic, which presents real conditions in the field with the simulation of En-Route Flight Information (EFI) traffic in the form of exercises and phraseology air - ground communication in text and in the form of sound to maximize learning for cadets in preparing for On the Job Training (OJT).

Based on the background above, the problems to be studied can be formulated, namely:

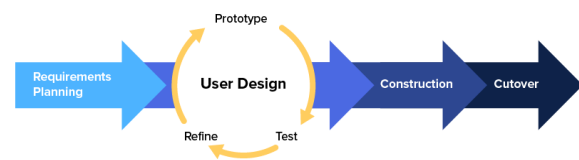
1. How to design the E-Module Practicum of En-Route Flight Information (EFI) Course with the Rapid Application Development (RAD) model at Surabaya Aviation Polytechnic?
2. How is the feasibility of E-Module Practicum for En-Route Flight Information (EFI) Course as a learning media on Learning Management System (LMS) at Aviation Polytechnic of Surabaya?

## Problem Limitations

The problem limitation used in this Final Project is to design the E-Module Practicum of En-Route Flight Information (EFI) Course as a practicum learning guide on the Learning Management System (LMS) of Surabaya Aviation Polytechnic with the Content Management System (CMS) Moodle.

## METHODS

This Final Project Research Method includes Research and Development (R&D) with the Rapid Application Development (RAD) model. There are 4 (four) stages, namely Requirements Planning, Design Workshop, Development and Implementation. The Rapid Application Development (RAD) model was developed by International Business Machines (IBM) in the 1980s and 1990s, when the demand for applications was increasing. With so many demands, people in the technology world had to find solutions to meet these demands. This model is the forerunner of AGILE project management, because it can keep up with the evolving pace of business and the increasing needs of the market.



**Figure 1** Flow of Rapid Application Development model.

Figure 1 is a development model of Rapid Application Development (RAD). This model will be used to design the En-Route Flight Information (EFI) Practicum E-Module. The steps in the Rapid Application Development (RAD) model are easier to understand, here is an explanation of the stages of E-Module development with the Rapid Application Development (RAD) Model.

The Rapid Application Development (RAD) model is a system design method with a faster process with high quality results (Purnia, 2018). Another reason why researchers decided to use this method is because the Rapid Application Development (RAD) model has faster development properties when compared to other traditional system development methods such as Waterfall and AGILE [5].

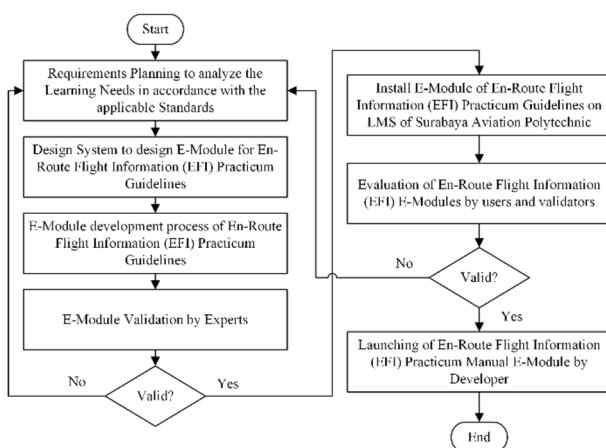
Rapid Application Development (RAD) is one of the methods used to develop android applications (android mobile development). According to James Martin "Rapid Application Development (RAD) is a designed development cycle that can provide much faster development and higher quality results than those achieved with the traditional life cycle". This software application development method consists of 4 stages, namely Requirements Planning Phase, User Design Phase, Construction Phase and Cutover Phase [6] [5] [7]

## Component of E-Module

The hardware used to design the E-Module is a portable computer/laptop with supporting specifications and the required accessories such as a mouse and keyboard to facilitate the work.

Software is a collection of several commands executed by a computer machine in carrying out its work. This software is a record for computer machines to store commands, as well as documents and other archives [8]. The following software is used such as Canva to design the E-Module. Windows 11 Home for the Operating System runs all existing systems, Learning Management System (LMS) Aviation Polytechnic Surabaya based on Content Management System (CMS) Moodle. Then Heyzine Flipbook is a website for reading Portable Document Format (PDF) so that it can be read like a printed book through electronic media such as laptops, tablets, and cellphones.

**Figure 2** Stages of E-Module development using Rapid Application Development model.



## Data Collection Techniques

Data collection techniques based on data analysis techniques in accordance with the characteristics of qualitative research, namely using several data collection components including:

### 1. Survey

Survey is an activity to obtain information related to a phenomenon on the object to be studied. To find out the need for the fulfillment of the En-Route Flight Information (EFI) Practicum E-Module, the researcher conducted a needs survey to representatives of 10 students from the 6<sup>th</sup> batch of Flight Communication Diploma 3 Study Program cadets.

### 2. Interview

Researchers conducted a preliminary study through interviews to get the problems that need to be researched and find out the initial data in the study in order to obtain information so that it becomes input into the development of E-Module Practicum-based teaching materials.

### 3. Documentation

Documentation is carried out to complement the data from the Survey, Interview, and Material Validation Test and Media Validation Test, namely in the form of photos or documentation related to the stage of the En-Route Flight Information (EFI) Practicum E-Module development process.

## Testing Techniques

Testing will be carried out when the development of the En-Route Flight Information (EFI) Practicum E-Module is made by making an E-Module assessment instrument covering in terms of Material and in terms of Media. The testing technique in this study uses Expert Judgment. Expert Judgment is carried out to measure the level of feasibility of the material and media developed by validating the Material Experts and Media Experts, and to find out whether the material needs improvement or not before being tested.

## RESULT AND DISCUSSION

### Requirements Planning

Researchers conducted a Needs Planning for E-Module Practicum En-Route Flight Information (EFI) to research respondents with the aim of identifying the objectives of the application or system and identifying information needs to achieve goals. Then, for user involvement not only from one level in an organization, but several levels of the organization so that the information needed for each user can be fulfilled properly [7]. The Practicum E-Module Needs Survey was conducted to determine the needs of cadets and teaching staff for the fulfillment of Practicum Learning for En-Route Flight Information (EFI) courses as a guide that can be used effectively and efficiently. Needs survey grille for the En-Route Flight Information (EFI) Practicum E-Module to be filled in by research respondents, several cadets from the 6<sup>th</sup> Diploma 3 Aeroaeronautical Communication Study Program, totaling 10 respondents. After conducting the Needs Survey Step, the Interview stage was carried out with the resource person Mr. Ady Sumarno, S.A.P., as the Lecturer for the En-Route Flight Information (EFI) Course. The interview was conducted to find out the needs of the E-Module made from the perspective of the teacher to be adjusted to the needs of the learners (cadets).

### Design System

At this stage is to carry out the process of designing and making improvements if there are still design discrepancies between the Semester Learning Plan (RPS) as a reference and the needs of teachers and educators with the consideration of the Lecturer as well as the Material Expert Validator. In this stage the researcher designs the draft material to be inserted into the Canva graphic design application. Then after entering all the material into Canva, namely continuing the conversion of Portable Document Format (PDF) to the Heyzine Flipbook website so that the file can be read like a physical book.

The results of Design System are the next stage of the Needs Planning stage, which starts from knowing the needs of the cadets and lecturers. The results of the Design System are the stage of the Material Validation Test which was carried out on August 16, 2023 indirectly via Google Meet with Mr. Ady Sumarno, S.AP., as the En-Route Flight Information (EFI) Lecturer. The data from the Validator was developed as the basis for the Testing Stage (Expert Judgment) whether the E-Module developed is suitable for use as future learning. The figure below will present the content design of the En-Route Flight Information (EFI) Practicum Course on the Learning Management System (LMS) of Surabaya Aviation Polytechnic that has been made. The content is a display of cadets when accessing the En-Route Flight Information (EFI) Practicum course like figure 3.

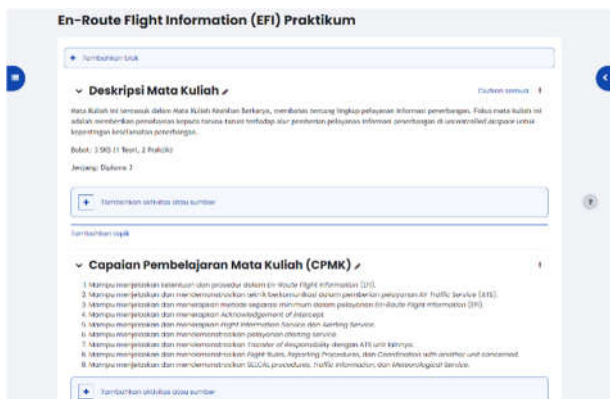


Figure 3 Course Content En-Route Flight Information (EFI) Practicum on Learning Management System (LMS).

### Development

After the design of the system to be created has been approved by both users and analysts, at this stage the programmer develops the design into a program. After the program is completed either partially or as a whole, a testing process is carried out on the program whether there are errors or not before being applied to an organization. At this time, the user can provide feedback

on the system that has been made and approval of the system [7]. E-Module development refers to the previous stage, namely System Design and Requirements Design, including:

1. E-Module development according to the results of the design stage;
2. Product Validation in terms of media to determine the performance of the E-Module on the media used; and
3. E-Module Improvement based on Media Expert Suggestions.

Then the Development Result is the Media Validation Test carried out on August 16, 2023 indirectly through Google Meet with Mr. Setyabudi, M.T., as the Lecturer of Basic Information and Technology Course. The data from the Validator was developed as the basis for the Testing Stage (Expert Judgment) whether the E-Module developed is suitable for use as future learning in terms of the media used for learning. Before being revised by the Media Expert, the E-Module display on the Heyzine Flipbook website did not have a button to change the page before and after. After reconfiguring the website, researchers only activate the page change button to appear on the user display to facilitate access to the Practicum E-Module page that has been developed.



Figure 4 Display before being revised by the Media Expert.

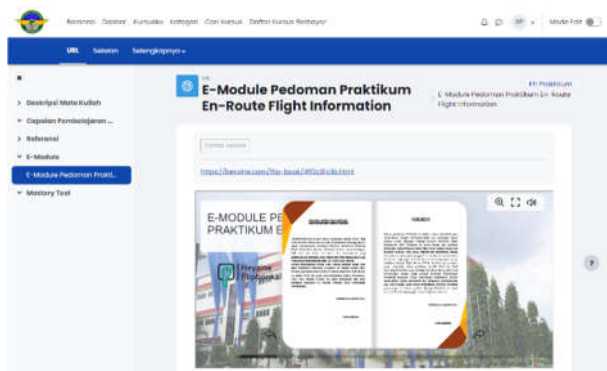
It can be seen in Figure 4 that the flipbook display is not yet available on the right side and the bottom left side of the flipbook. With the button, it will make it easier for users to access each page.



Figure 5 Display after being revised by the Media Expert.

After activating the page change button, this will facilitate user accessibility in accessing each page on the E-Module that has been developed.

On the other hand, at this stage it is also done by collecting materials related to En-Route Flight Information (EFI) Practicum both in the form of video, audio, and animation as support in the E-Module developed. Then the researcher combines all parts of the E-Module using a graphic design website in the form of Canva and Heyzine Flipbook to convert the E-Module material that has been made on Canva to be made into a display like a physical book on the Heyzine Flipbook website. The following is the E-Module display developed on the Heyzine website.



**Figure 6** Display after being revised by the Media Expert.

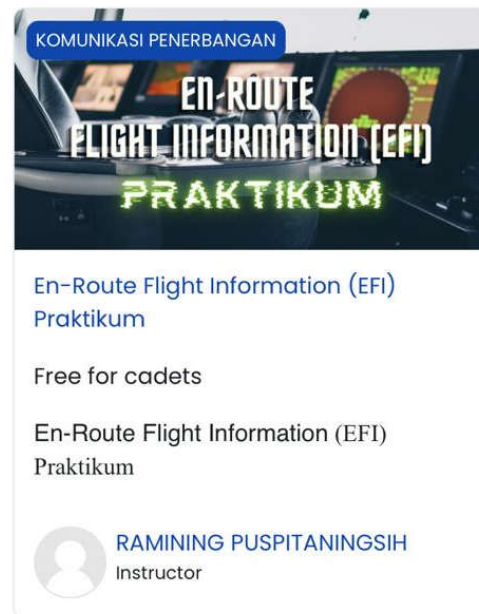
In Figure 6 is the appearance of the E-Module Practicum En-Route Flight Information (EFI) after development from the system design stage. This development was carried out by entering the Heyzine Flipbook link previously the E-Module in the form of Portable Document Format (PDF) was uploaded to the website <https://heyzine.com/>.

## Implementation

After the development process is carried out by users and analysts, at this stage the implementation of the development results is carried out by aligning the needs design and system design stages. At this stage, the results of the design stage will be applied in the form of an E-Module product for En-Route Flight Information (EFI) practicum and declared feasible by Material Experts and Media Experts for use. Before that, researchers exported the material that had been made through the Canva application into Portable Document Format (PDF). After becoming a Portable Document Format (PDF) format, so that it can be read like an original physical book, researchers use the help of the Heyzine Flipbook website (<https://heyzine.com/>).

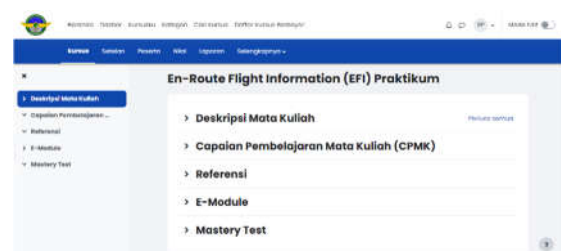
Implementation results are the final stage in this research. From this Implementation stage, researchers installed the E-Module of En-Route Flight Information

(EFI) Practicum into the Learning Management System (LMS) of Surabaya Aviation Polytechnic after the Material Expert Validation Test and Media Expert Validation Test were carried out. The E-Module that has been implemented using Heyzine Flipbook is then implemented into the Learning Management System (LMS) of the Surabaya Aviation Polytechnic with the link <https://courses.poltekbangsby.ac.id/>. In the picture below is a thumbnail view of the En-Route Flight Information (EFI) Practicum Course with the contents of the En-Route Flight Information (EFI) Practicum E-Module content in it.



**Figure 7** Thumbnail Course En-Route Flight Information (EFI) Practicum on Learning Management System (LMS).

In Figure 7 is the Thumbnail view of the En-Route Flight Information Practicum Course on the Learning Management System (LMS) of Surabaya Aviation Polytechnic. This display will be an identity of the Course developed and users can find out whether the Course access restrictions are paid or not. In addition, users can find out who taught and/or created the En-Route Flight Information (EFI) Course on the Learning Management System (LMS) of the Surabaya Aviation Polytechnic.



**Figure 8** Thumbnail Course En-Route Flight Information (EFI) Practicum on Learning Management System (LMS).

Figure 8 is a view of the content on the En-Route Flight Information (EFI) Practicum Course that has been developed from the system design results stage. This display will make it easier for students (cadets) to access some of the content presented by the Course developer.



**Figure 9** E-Module Display En-Route Flight Information Topic Section 1

Then in Figure 9 is the appearance of the E-Module previously designed through the Canva graphic design application and continued uploading the results of the E-Module that has been made so that it can be read like a conventional Module or book but in the Electronic version through the Heyzine Flipbook website.

## Final Result

Researchers used qualitative methods to determine the results of the development of this Practicum E-Module. Data collection was carried out by interviews obtained from the lecturer teaching the En-Route Flight Information (EFI) course as well as the Material Expert Validator, Mr. Ady Sumarno, S.AP., and also the lecturer teaching the Basic Information and Technology course as a Media Expert, Mr. Setyabudi, M.T.. Then the results of data collection in the form of a Needs Survey for the En-Route Flight Information (EFI) Practicum E-Module from 10 respondents from the 6th batch of cadets of the Diploma 3 Aviation Communication Study Program can be concluded that currently there is no En-Route Flight Information (EFI) Practicum Module. However, it is still in the form of related documents which are still in the form of Portable Document Format (PDF) sent via the Whatsapp application. Based on the Needs Survey conducted to respondents, it was found that the E-Module is needed to support En-Route Flight Information (EFI) learning in terms of practicum which is expected by cadets to make it easier to learn to understand existing material efficiently and effectively. This is also based on the results of interviews from lecturers as well as Material Expert Validators obtained information that the E-Module Practicum En-Route Flight Information (EFI)

material is very feasible for learning and can keep up with technological developments so that cadets do not only depend on lecturers and instructors in learning, but can learn independently without being limited by space and time.

## CONCLUSION

Based on the results of the design of the En-Route Flight Information (EFI) Practicum E-Module that has been determined, the following conclusions can be concluded: This research design produces an E-Module Practicum En-Route Flight Information (EFI) which is implemented into the Learning Management System (LMS) of the Aviation Polytechnic of Surabaya with learning features that can attract reading interest and facilitate understanding of cadets and students to use video, audio, images, and documents. In addition, there is also a Mastery Test at the end of accessing the E-Module to measure how far the cadets or students understand the learning material presented in the form of an E-Module on the Learning Management System (LMS). And, the results of data collection given to Material Experts and Media Experts as well as a needs survey to 10 respondents of the 6th batch of cadets of the Diploma 3 Aeronautical Communication Study Program are deemed necessary to be developed as a technology-based learning innovation because it can make it easier for cadets or students who take the En-Route Flight Information (EFI) Practicum Course more interesting and very efficient.

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