

MILITARY INSTITUTE OF SCIENCE AND **TECHNOLOGY**

Department of Computer Science and Engineering

HEALTH MONITORING OF A PILOT **USING IOT WRISTBAND**

System Requirements Specification (SRS)

Group E (Sec A), CSE-18

Group Members.

SERIAL	ID	NAME	EMAIL
01	201814002	Maj Rezoan	mrhchandan@gmail.com
02	201714111	Lt Mostofa	anindya.mostofa@gmail.com
03	201814011	Flg Offr Nafiun	nafiunpolok@gmail.com
04	201814010	Offr Cdt Arnob	arnobsmail@gmail.com
05	201814012	Offr Cdt Khan	ryankhankayoger@gmail.com

Contents

1.	Preface	1
2.	Introduction	1
2.1.	Purpose	2
2.2.	Intended Audience	2
2.3.	Product Scope	3
3.	Glossary	4
4.	Requirements Discovery	5
5.	User Requirements	6
6.	System Architecture	7
7.	System Requirements Specification	8
7.1.	System Requirements	8
7.2.	Requirements Classification	8
8.	System Model	9
8.1.	Context Diagram	9
8.2.	Use Case Diagram	10
8.3.	Activity Diagram	13
8.4.	Sequence Diagram	16
9.	System Evolution	19
10.	Appendices	20

1. Preface

A good health and sound mind are the preliminary requisite of happiness. Good health is often referred as wealth. If our health is sound, we can do our daily activities properly and sincerely. Like every individual, it is of utmost important for an aircraft pilot as well. Whether a pilot flies his bird individually or with passengers, he needs to be in absolute health state to conduct his job. He needs to be stout physically and must get relieved from any kind of stress. It is to be mentioned that many aircraft crashes occur due to faulty management of aircraft pilots. Most of it is related with the sudden change of mental and physical condition of the pilot. Our project idea was basically initiated and aimed to reduce these losses. The project involves monitoring the physical and mental state of a pilot. A thorough medical check-up for a pilot is done before any flight. But during the flight a pilot may get sick physically or psychologically. We will be able to receive the updated health state of a pilot and give him support by taking medical professionals. We are to build an user friendly smart wrist band that is capable of examining the health condition of an aircraft pilot. We believe that the lives of the pilot as well as the aircraft will be saved after using our wrist band. It will be directly monitored by the Air traffic control room along with expert medical personnel. The paper will provide a complete idea about our health monitoring wrist band for pilots. We hope, this project will minimize the loss of lives and property to a great extent.

2. Introduction.

2.1 Purpose. The scheduled health checkup for a pilot before the commencement of his flight is a traditional process. But during the flight his health is not monitored. The pilots are well trained for the flights. Yet it might be a possibility, when a pilot may fall sick during a flight. Keeping this eventuality in mind, the main purposes of our project are as following:

- a. To monitor the health of a pilot as soon as possible.
- b. To monitor the blood pressure, heart rate, oxygen level and body temperature of the pilot.
- c. To provide mental support to the pilot.
- d. It is presumably be the first one of its kind as we could not trace any previous version.
- e. It will also find out the altitude and fire information of the cockpit.
- f. The unusual rise up or downfall of the health information of a pilot will be the benchmark of our project.

2.2 Intended Audience. The users for our IOT wristband will be mainly the pilots during their time on the aircraft. Their health state will be monitored by the air traffic control room or the concerned authority. Therefore, they will also be our audiences. Most importantly, it has to be understood by the physician in charge. This document contains all the necessary components and architecture model of the product and system. So apart from the mentioned, anyone who is interested in this project can get necessary information about this by reading this document.

2.3 Product Scope. There are many types of smart watch but none of them are dedicated for health monitoring. Again, there are many equipment for health monitoring but none of them are dedicated for the pilot who are flying their aircrafts. Our product will provide necessary information regarding the medical condition of the pilot. The wrist band will have required number of sensors connected to an android device to provide records of the instance. It will help us to communicate, transfer data and generate information regarding a pilot's health. The personal information of the pilot will be recorded initially. The gadget will provide the information about heart rate, blood pressure, the altitude, oxygen level and body temperature of the pilot. The scope of the product is totally based on this. While building the wrist band, our main focus will be mainly on the following:

- a. Theoretical CS and Algorithm
- b. Internet of Things (IoT)
- c. Database Management
- d. Information Security
- e. App development
- f. data transfer
- g. communication
- h. hardware wrist watch

3. Glossary.

3.1. Heart Rate Sensor. An optical blood flow sensor will be integrated from which heart rate can be checked.

3.2. Ambient Temperature Sensor. Ambient temperature could be compared to skin temperature in the service of determining exertion levels.

3.3. Accelerometer. Accelerometer measures body movement to track the pilot's movement pattern.

3.4. Barometer. Barometer can measure changes in altitude, which is relevant to sudden fall or crash of aircraft.

3.5. Pulse Oximeter. This sensor measures blood oxygen, a key data point for reporting accurate pulse rates and health status of pilot.

3.6. Fire Sensor. CO & CO2 level and air quality sensor determines their quantity in air and determines if there is any smoke or fire in cockpit.

3.7. Health monitoring system. In case of any abrupt changes in one's heart-rate or body temperature alert is sent about the individual using IoT. Thus, health monitoring system based on IoT uses internet to effectively monitor one's health and helps the user monitoring their loved ones from work and saves lives.

3.8. IoT. The *Internet of Things (IoT)* describes the network of physical objects, "things" that are embedded with sensors, software, and other technologies for the purpose of connecting and exchanging data with other devices and systems over the internet.

3.9. Air Traffic Control. *Air traffic control (ATC)* is a service provided by ground-based *air traffic controllers* who direct aircraft on the ground and through *controlled* airspace, and can provide advisory services to aircraft in *non-controlled* airspace.

4. Requirements Discovery.

4.1. We have consulted regarding few journals and IEEE papers about health monitoring system. We have kept some notes on how to insert various sensors in the IOT wrist band. We have also learnt about integrated chips related to these.

4.2. We also visited the air force base to collect information on how the communication is done between ATC room and flying aircrafts.

4.3. We have visited an air traffic control room and checked how the controller communicates with pilots. We got the idea about their existing communication system

4.4. We found several projects related to health monitoring system in the internet. We have taken the crux from it relating to our project requirement.

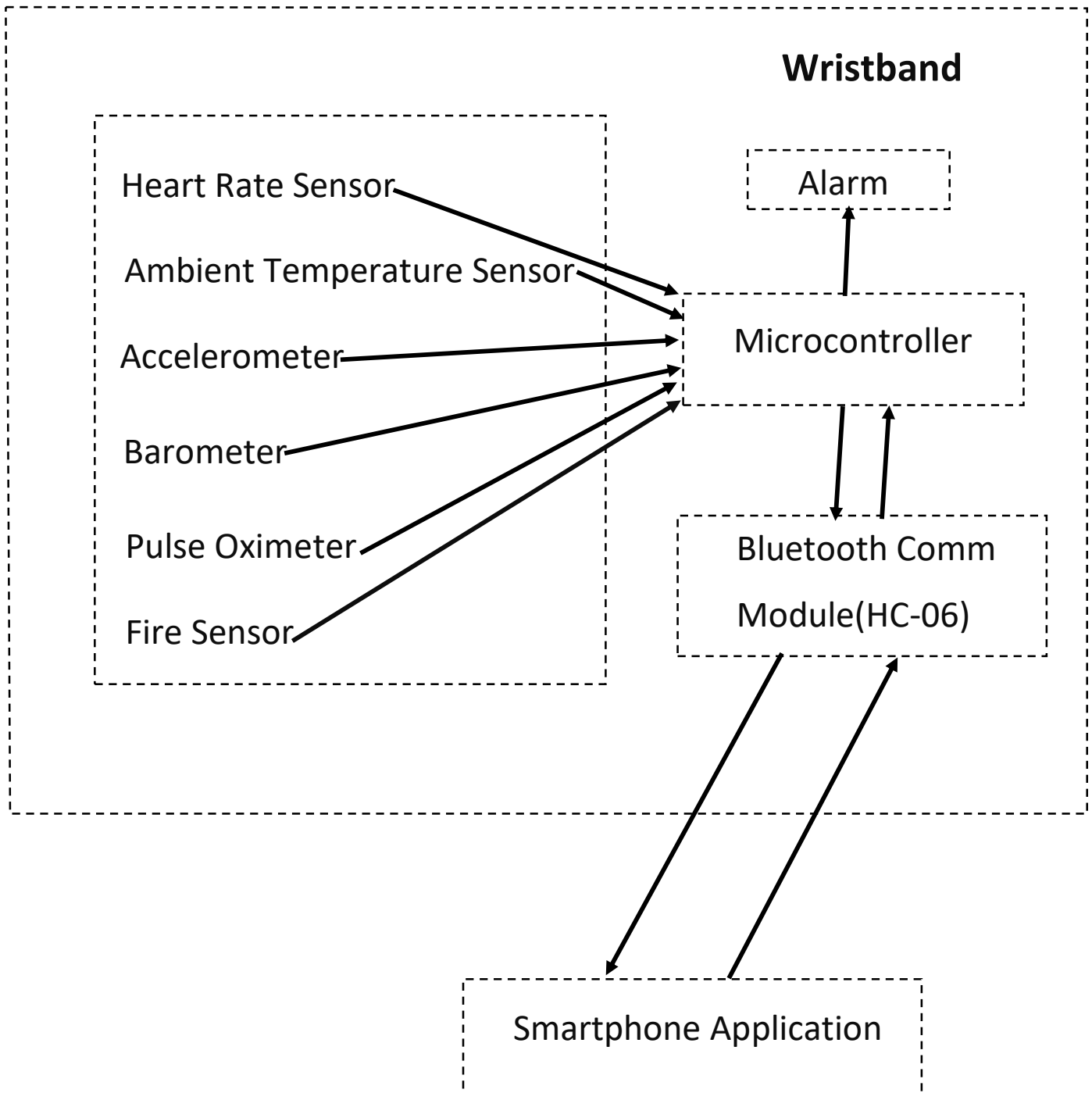
4.5. We had a conversation with a GDP pilot and a civil aviation pilot. We had some queries to them. The details of the interview are appended with this paper.

4.6. We have visited Jessore CMH and had a discussion with a physician. We clarified our doubts regarding the benchmark of various health condition for a healthy person. The salient features of the interview are attached with the appendices section of this paper.

5. User Requirements.

- 5.1. The wristband should be comfortable to use for the pilot.
- 5.2. The app should have the data of the participating pilots recorded initially to monitor their health.
- 5.3. Perfect reading and transfer of data without any distortion from wrist band to the android device needs to be done.
- 5.4. The device should hold enough charge to minimize unnecessary shut down of the system.
- 5.5. The application should be simple and user friendly.
- 5.6. The data has to be sent to the ATC room without any interruption to get monitored by the physician.

6. System Architecture.



7. System Requirement Specifications.

7.1 System Requirements.

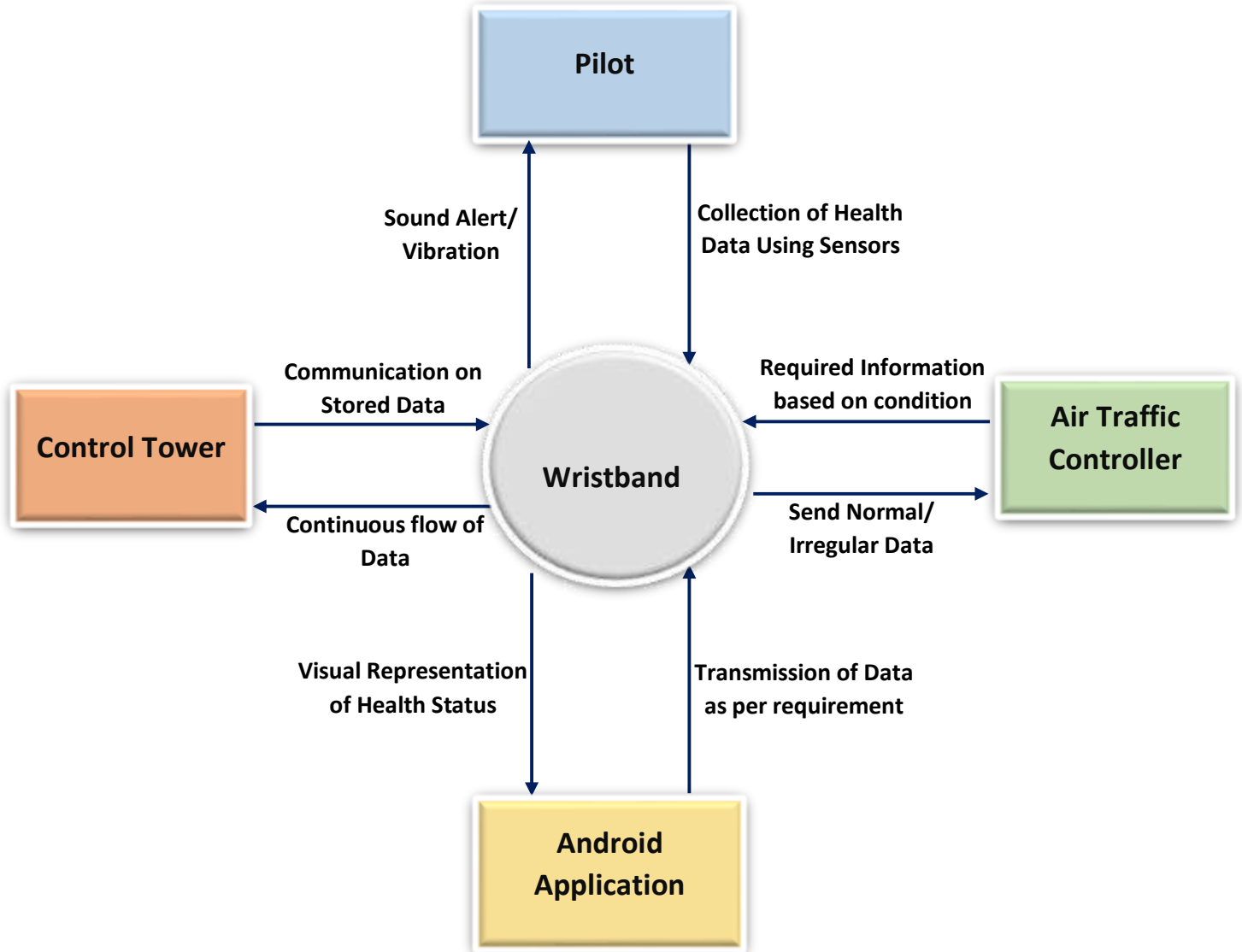
- a. The wristband will be light in weight and will be sweating free.
- b. The wristband will be having a unique ID no which will also be recorded in the app. That will help us to keep the track of the particular pilot needing attention.
- c. The whole system will have an android interface to keep track of the various data.
- d. High powered lithium rechargeable battery will be used so that it does not get shut down unnecessarily.
- e. The algorithms and the language of the app will be simple so that it can be modified as per future requirement.
- f. The data will be sent to ATC room by VHF. By proper frequency modulation we can reduce the data reduction.

7.2 Requirements Classification.

Ser	User Requirements	Type (Functional)	Type (Non-functional)	Remarks
1.	System should be able to take the readings.	√	X	
2.	System should be able to calculate the anomalies with the standard readings	√	X	
3.	System should be able to communicate	√	X	
4.	System UI should be easy to understand	√	X	
5.	Time	X	√	

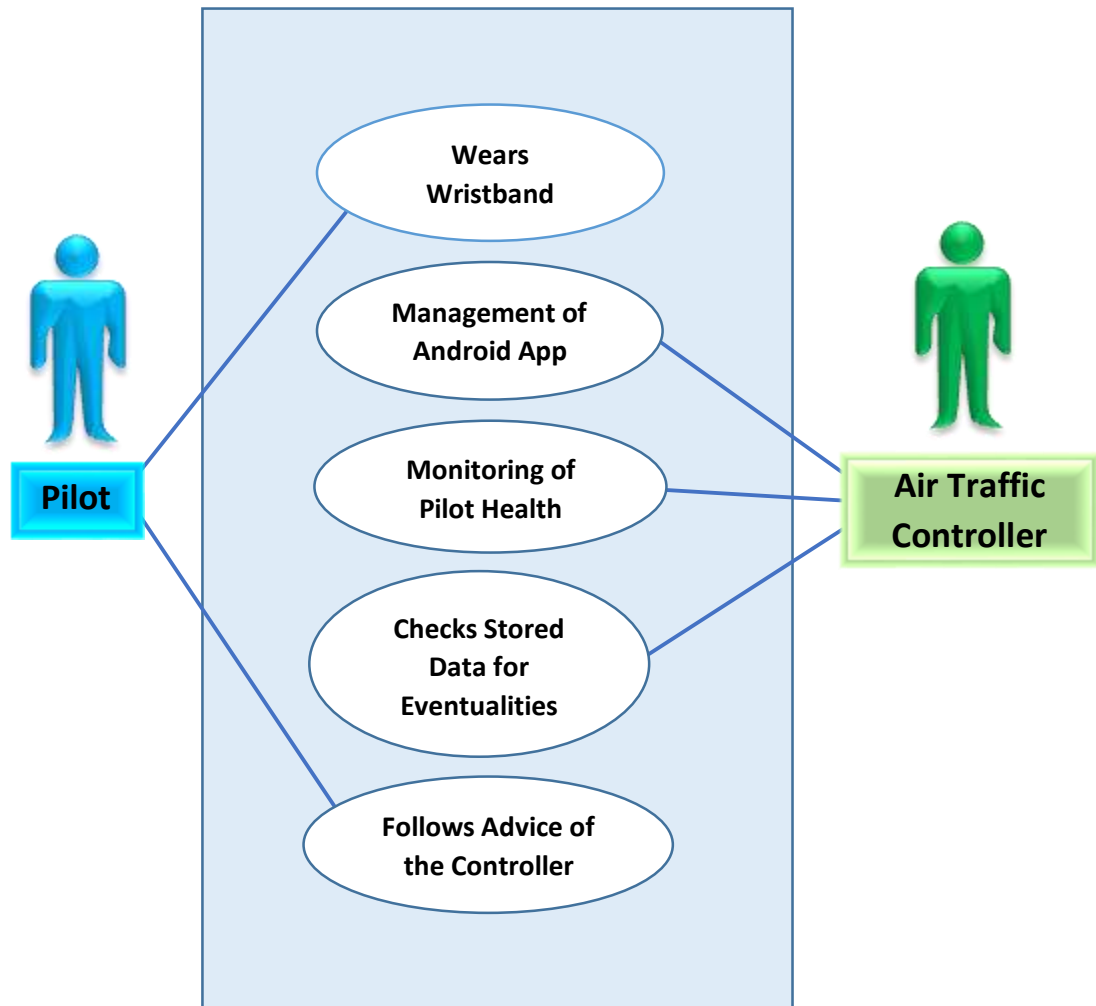
8. System Model.

8.1 Context Diagram.



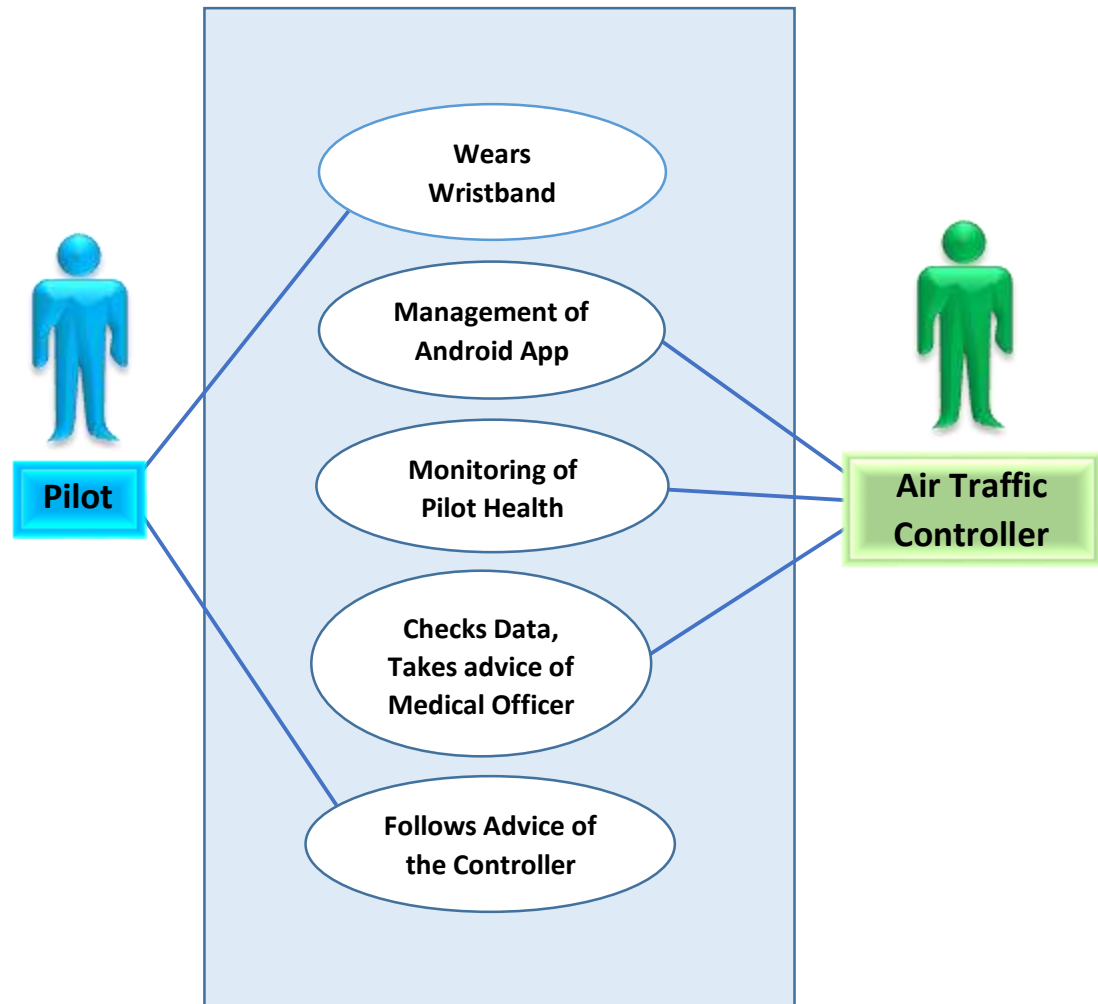
8.2 Use Case Diagram.

a. Normal Scenario.



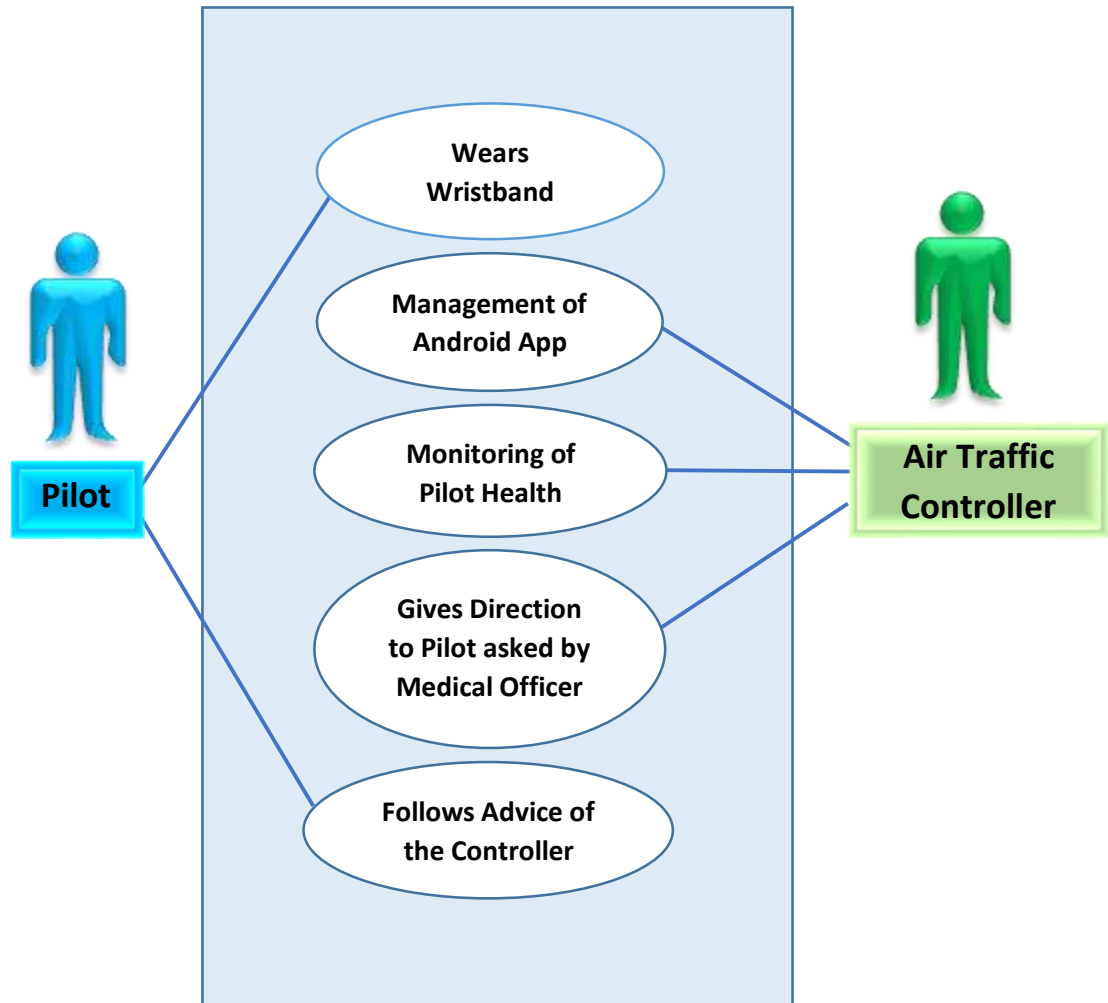
Use Case	Normal Scenario
Actors	Pilot, Air Traffic Controller
Description	A pilot wears the wristband and the readings of the sensors are seen in the android app by the air traffic controller. From the standard readings, controller can tell whether the condition of the pilot is fit for flying or not. The controller gives necessary advice by monitoring pilot's health.
Data	Readings from the sensors
Stimulus	Data collection, command issued by Controller
Response	Do nothing
Comments	i. The ATC tower should have a good communication with pilot. ii. The android app should have accurate data.

b. Moderate Scenario.



Use Case	Normal Scenario
Actors	Pilot, Air Traffic Controller
Description	A pilot wears the wristband and the readings of the sensors are seen in the android app by the air traffic controller. From the standard readings, controller can tell whether the condition of the pilot is fit for flying or not. The controller gives necessary advice by monitoring pilot's health.
Data	Readings from the sensors
Stimulus	Data collection, command issued by Controller
Response	Alert, Return to airport
Comments	i. The ATC tower should have a good communication with pilot. ii. The android app should have accurate data.

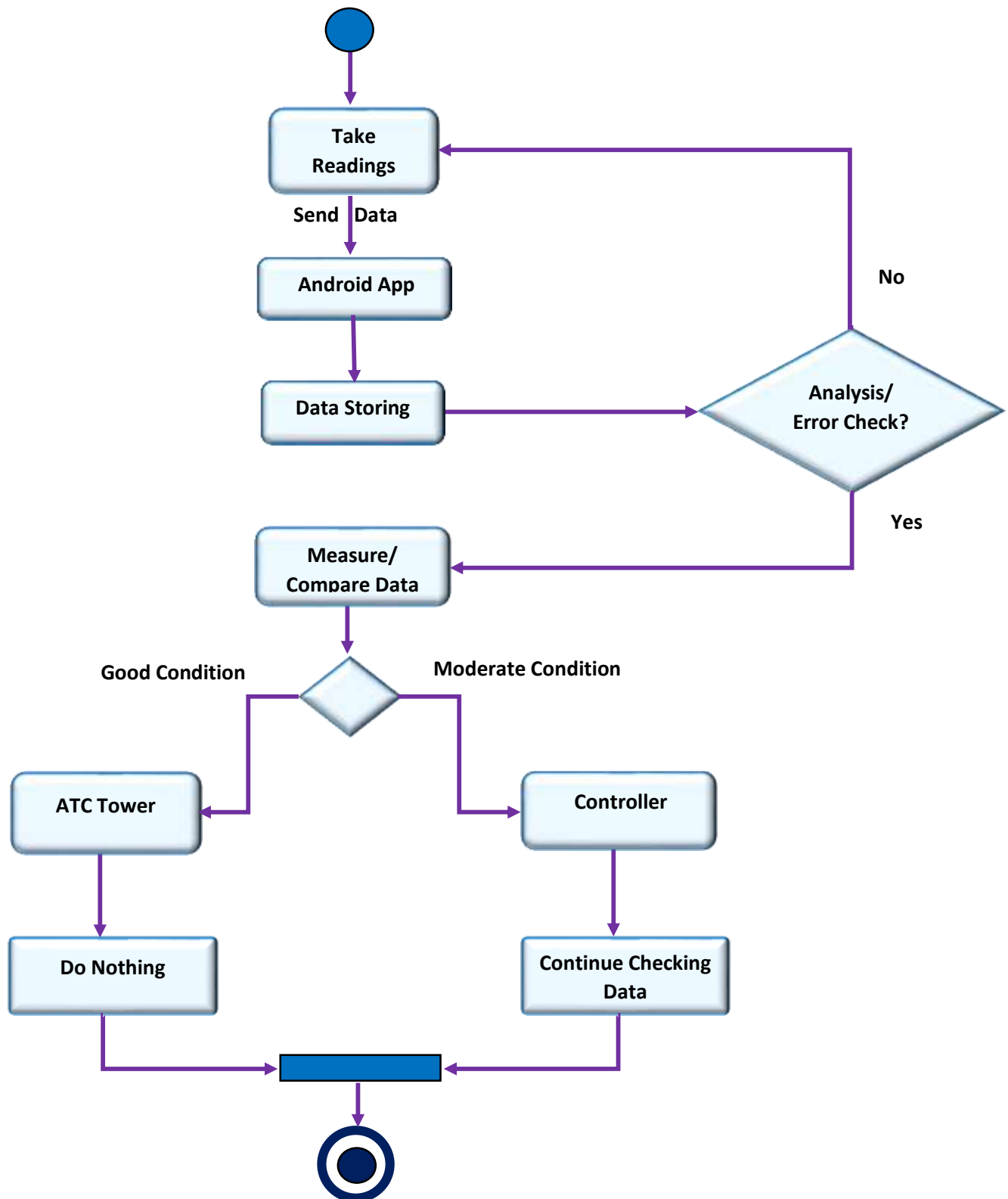
c. Critical Scenario.



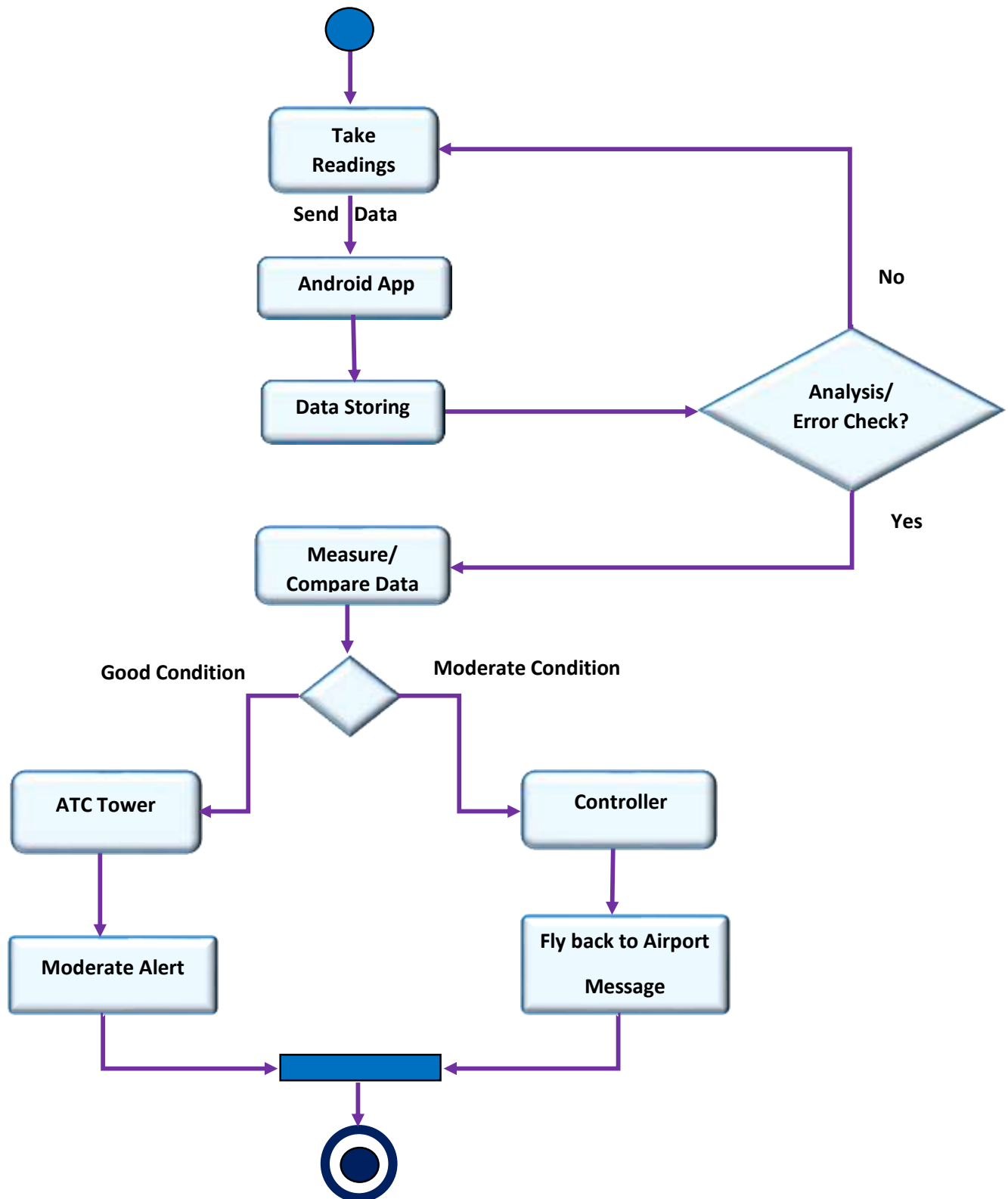
Use Case	Critical Scenario
Actors	Pilot, Air Traffic Controller
Description	A pilot wears the wristband and the readings of the sensors are seen in the android app by the air traffic controller. From the standard readings, controller can tell whether the condition of the pilot is fit for flying or not. The controller gives necessary advice by monitoring pilot's health.
Data	Readings from the sensors
Stimulus	Data collection, command issued by Controller
Response	Alert, Eject/ Medication advice
Comments	i. The ATC tower should have a good communication with pilot. ii. The android app should have accurate data.

8.3 Activity Diagram.

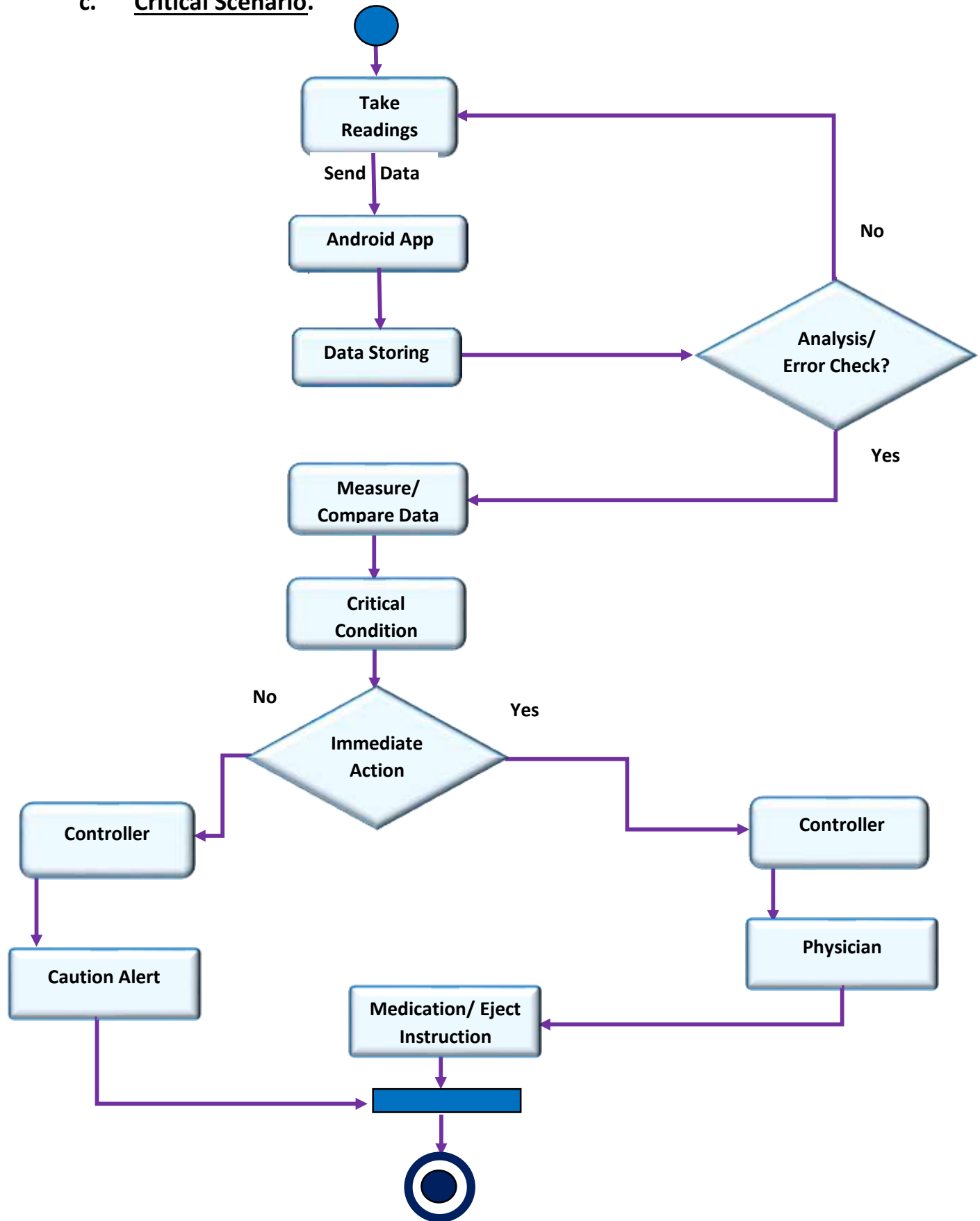
a. Normal Scenario.



b. Moderate Scenario.

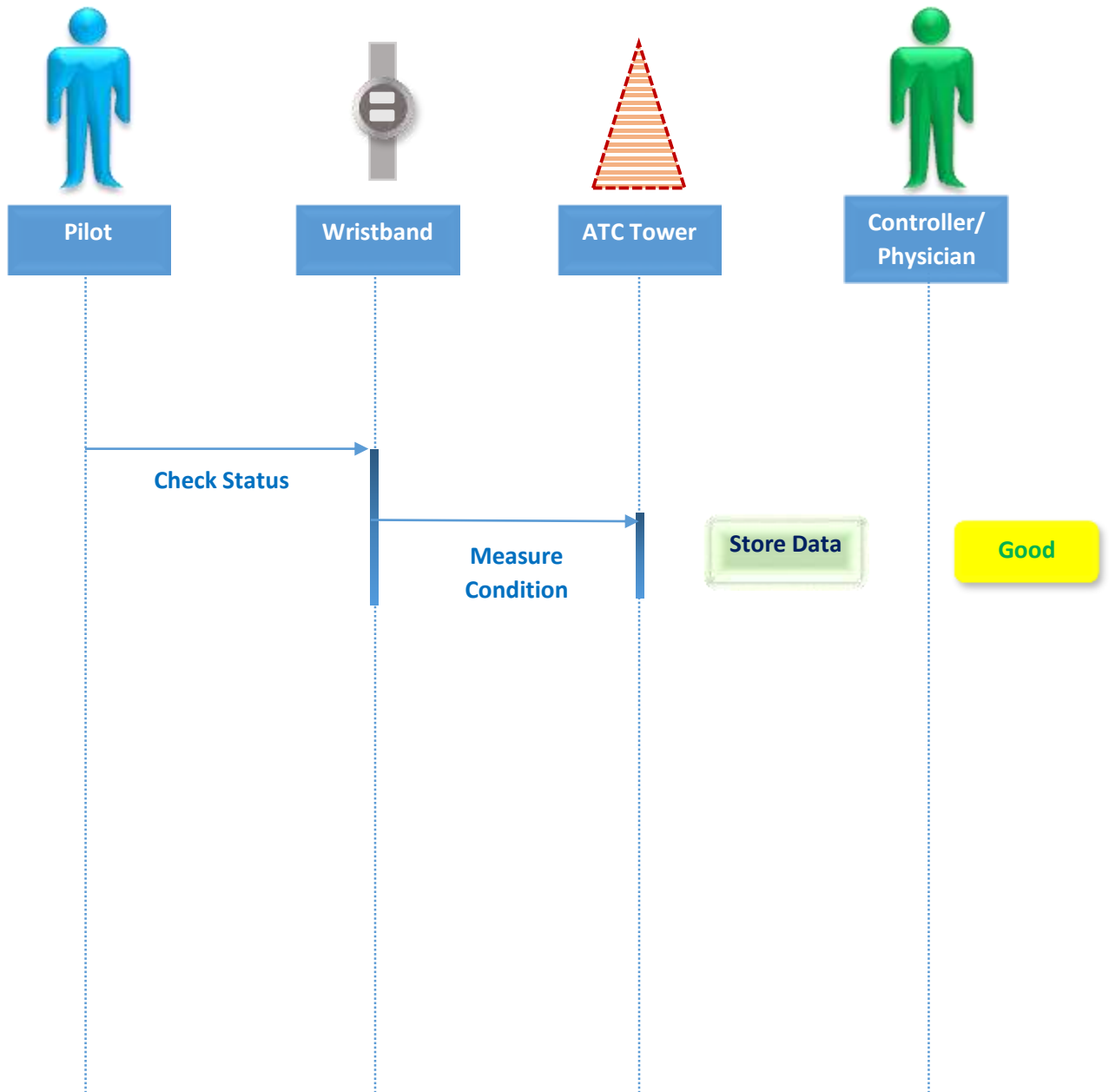


c. Critical Scenario.

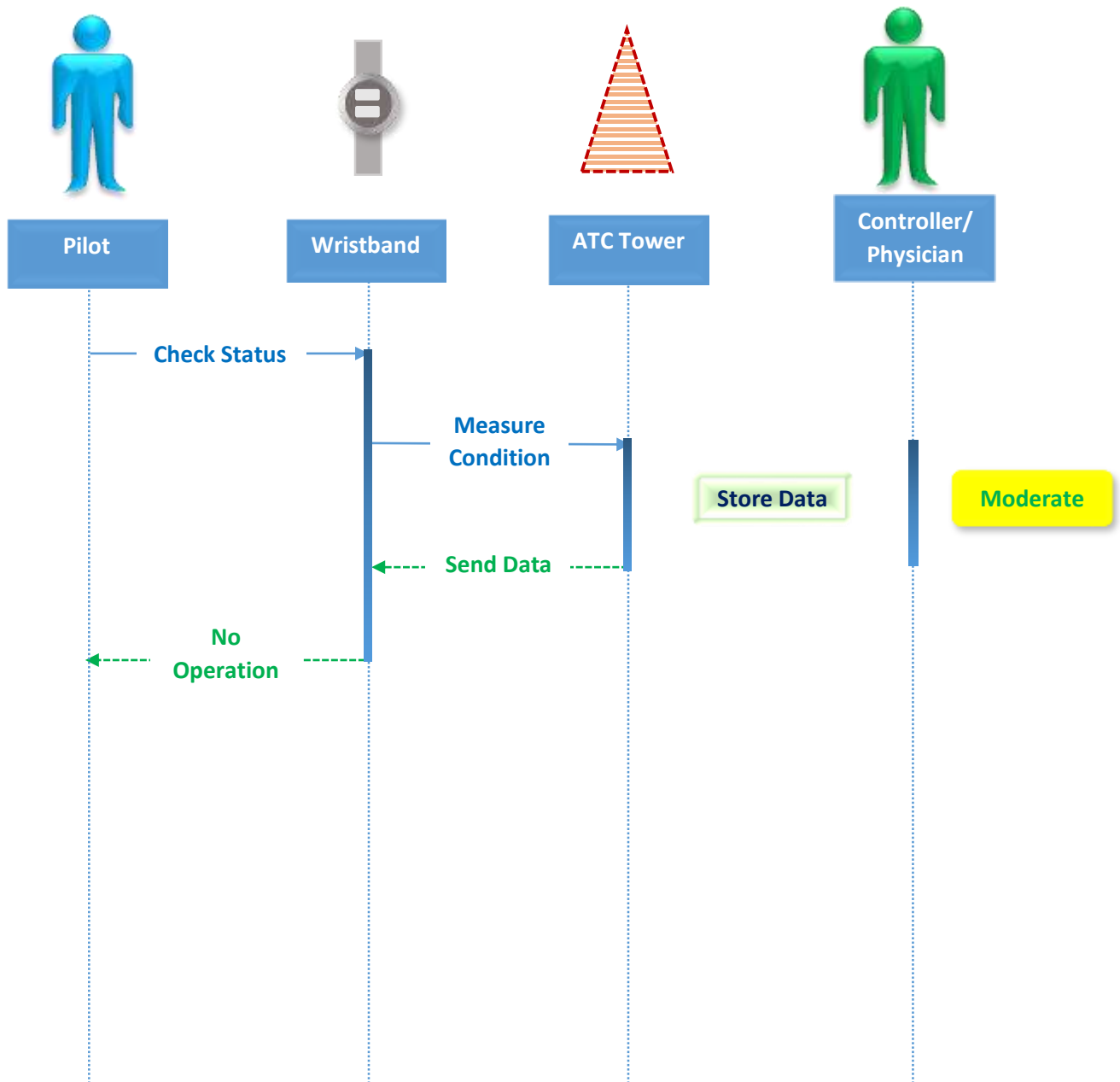


8.4 Sequence Diagram.

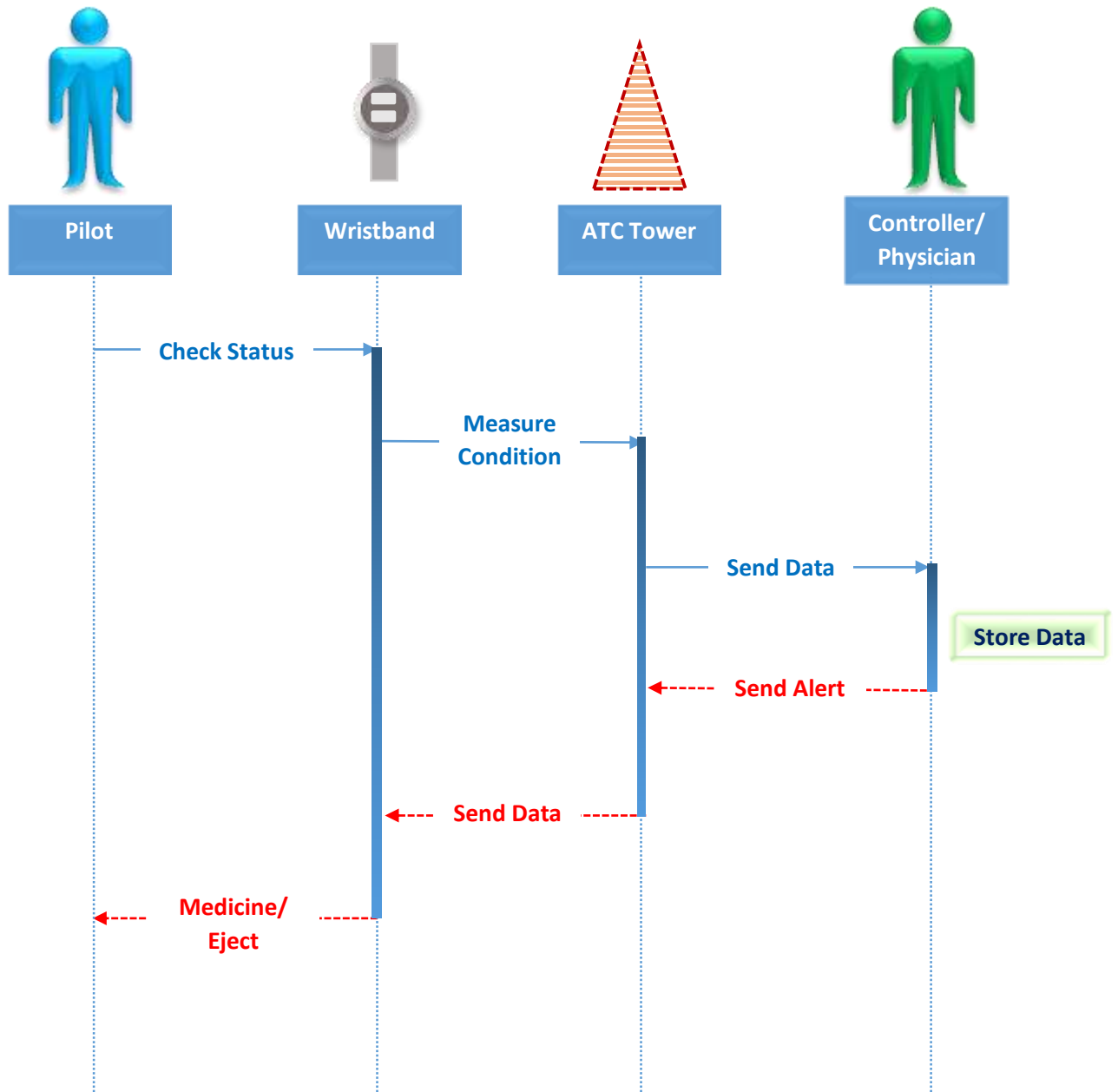
a. Normal Scenario.



b. Moderate Scenario.



c. Critical Scenerio.



09. System Evolution.

9.1. With the span of time more new dimensions will be added to our project. More sensors will be added to check the health state of the pilot more accurately.

9.2. The gadget will become smaller and lighter in size and weight.

9.3. It will work by invoice command.

9.4. If aircraft communication system fails, it will take over the air communication system as an alternative.

9.5. For aircraft system failure, it will show the way point towards the destination.

9.6. It will notify about the bad weather condition.

9.7. If pilot is puzzled, it will give direction to control the aircraft.

9.8. If pilot is senseless, control room will be able to execute emergency ejection through the gadget.

9.9. Now-a-days robots are replacing human jobs. So, in future battles will be fought by drones and aircraft will be controlled by the control room directly. No more requirement of the pilot and so no more requirement of the gadget.

10. Appendices.

10.1 Interviews.

a. Flg Offr Hasnaim Rahman (GDP), BAF MTR Base Jessore,
Interviewed on 20 July 2020

1.Q: We are doing a project on health monitoring of a pilot using IoT wristband. If you don't mind to help us with some

information and your opinion .There is no system to monitor pilot's health during flying .Do you think that health monitoring during flight will help to reduce life risk of passenger and pilot both along with the aircraft?

Ans: Yes, I strongly agree that it will reduce life risk of passenger and pilot both along with the aircraft.

2.Q: Present health monitoring system of a pilot is sufficient or not. What do you think?

Ans: I don't think it's sufficient. Before flying our health checkup is done. But during flying there is no such system to monitor our health.

3.Q: Would you like to communicate with the ATC room in case of any health issue?

Ans: Yes. Normally we communicate with ATC room for take-off and landing. It will be very helpful if we can communicate for emergency health issue.

4.Q: Will wearing a wristband during flight cause any problem in controlling the aircraft?

Ans: No, there will not be any problem.

5.Q: Do you agree that health monitoring during flight will provide extra mental support to the pilot?

Ans: I think It will.

Thank you for your valuable time. Your answers helped us a lot to determine the course of our project.

b. Flt Lt Sabiqun Nahar Chowdhury (GDP), BAF BSR Base Dhaka, Interviewed on 16 July 2020.

1.Q: Assalamualaikum, sir. We are doing a project on health monitoring of a pilot using IoT wristband .If you don't mind to

help us with some information and your opinion .There is no system to monitor pilot's health during flying .Do you think that health monitoring during flight will help to reduce life risk of passenger and pilot both along with the aircraft?

Ans: Yes, I agree.

2.Q: Present health monitoring system of a pilot is sufficient or not. What do you think?

Ans: I don't think it's sufficient. It needs improvement.

3.Q: Would you like to communicate with the ATC room in case of any health issue?

Ans: Yes. It will be very helpful if we can communicate with ATC room for emergency health issue and get necessary guidelines.

4.Q: Will wearing a wristband during flight cause any problem in controlling the aircraft?

Ans: No, there will not be any problem.

5.Q: Do you agree that health monitoring during flight will provide extra mental support to the pilot?

Ans: Yes, I agree.

Thank you sir for your valuable time. Your answers helped us a lot to determine the course of our project. Assalamualaikum sir.

c. Sqn Ldr SK Imran Ali (Medical), BAF MTR Base Jessore, interviewed on 20 July 2020

1.Q: Assalamualaikum,sir. We are doing a project on health monitoring of a pilot using IoT wristband .If you don't mind to help us with some information and your opinion .May I know what procedures do you follow for pilot's health checkup?

Ans: Normally once in a month we check the physical condition of the pilot. And before they go for flying, their physical condition is checked.

2.Q: Do you have any procedure to monitor pilot's health during the flight?

Ans: No, we don't have.

3.Q: Do you feel the necessity of having health monitoring of a pilot during the flight?

Ans: Yes, I think it will be very helpful for the pilots.

4.Q: Do you agree that health monitoring during flight will help to reduce life risk of passenger and pilot both along with the aircraft?

Ans: Yes, I agree.

5.Q: Do you agree that health monitoring during flight will provide extra mental support to the pilot?

Ans: Yes, I agree. Normally most of the pilots don't understand their physical problem. If their health is monitored during flying, they will be highly benefitted.

6.Q: If we have a system to monitor pilot's health ,where necessary sensors will tell pilot's physical condition, will you be able to tell the pilots about their condition?

Ans: If from ATC tower they send the datas,then I will be able to tell the condition.

Thank you sir for your valuable time.Your answers helped us a lot to determine the course of our project. Assalamualaikum sir.

10.2 Surveys.

a. Survey Questions.

1) Present health monitoring system of a pilot is sufficient. What do you think?

2) Do you feel the necessity of having health monitoring during the flight?

3) Would you like to communicate with the ATC room in case of any health issue?

4) Do you feel the necessity of having advice of any specialist in case of any emergency health situation?

5) Will wearing a wristband during flight cause any problem in controlling the aircraft?

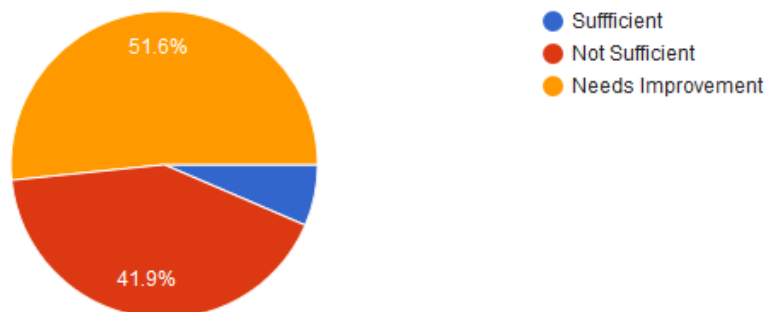
6) Do you agree that health monitoring during flight will provide extra mental support to the pilot?

7) Do you agree that health monitoring during flight will help to reduce life risk of passenger and pilot both along with the aircraft?

b. Survey Results.

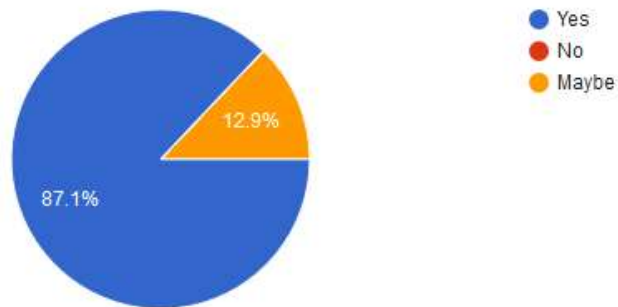
1. Present health monitoring system of a pilot is sufficient. What do you think?

31 responses



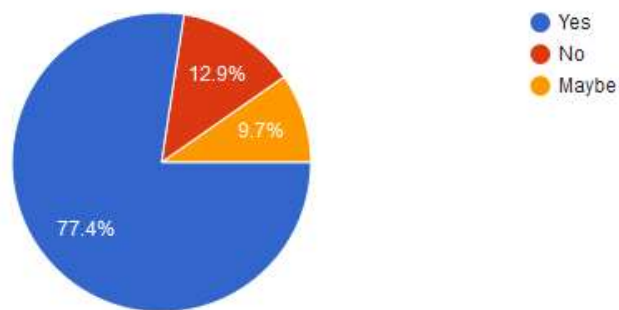
2. Do you feel the necessity of having health monitoring during the flight?

31 responses



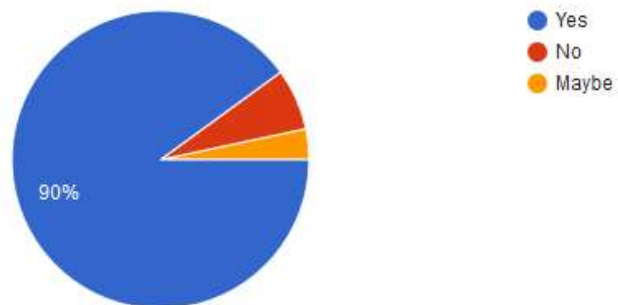
3. Would you like to communicate with the ATC room in case of any health issue?

31 responses



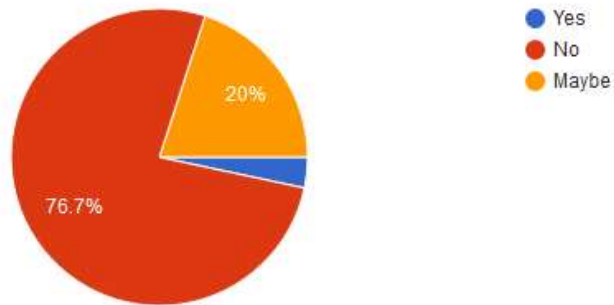
4. Do you feel the necessity of having advice of any specialist in case of any emergency health situation?

30 responses



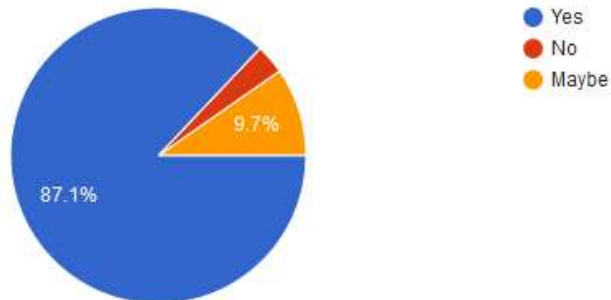
5. Will wearing a wrist band during flight cause any problem in controlling the aircraft?

30 responses



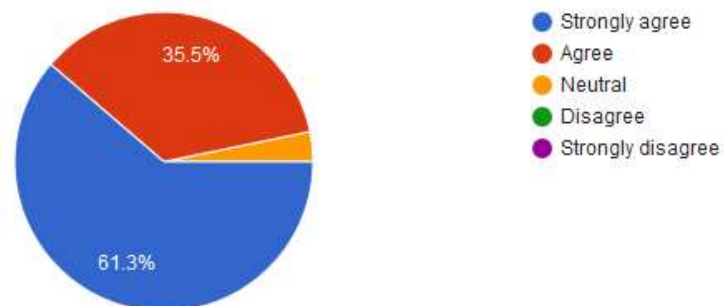
6. Do you agree that health monitoring during flight will provide extra mental support to the pilot?

31 responses



7. Do you agree that health monitoring during flight will help to reduce life risk of passenger and pilot both along with the aircraft?

31 responses



10.3. Project Hosting. The project will be hosted at Google Code. The complete source code along with the manual to operate the project and supplementary files will be uploaded.

- a. Google Link.
- b. QR Code.