A Review: Forthcoming Commercial Aviation and Cyber Risks

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ABSTRACT

Over the years have seen enormous development in digitalization and commercial aviation. As we know Internet of Things (IoT), Artificial Intelligence (AI) and cloud computing is trending technology in digitalization, but cyber security is major concern to adopt these technologies. Implementation of IoT, AI and cloud in commercial aviation need more attention. There are many challenges and cyber risks to implement these technologies in commercial aviation. Commercial aviation is booming and airports are under constant pressure to improve their security levels and services as passenger numbers continue to grow and the number of routes and aircraft increase. These technologies establish convenient service to passenger and it is also convenient to commercial aviation staff. Cyber risks are major concern in this digital era. These emerging technologies are transforming each and every industry in one from or another and commercial aviation is no exception. These technologies bring various advantages in any industry but cyber risks are concern. In this paper, we show forthcoming commercial aviation and cyber risks.

Keyword: - *Commercial Aviation, Artificial Intelligence (AI), Internet of Things (IoT), Cloud Computing, Cyber Risks and Digitalization*

1. INTRODUCTION

There are many applications possibly take place to enhancing commercial aviation services using AI, IoT or cloud. This AI, IoT or Cloud based application established painless services in commercial aviation. Computing and communications have undergone remarkable changes in recent decades. Computation is preferred on the go with a huge demand of mobility support in communicating [1, 2]. Below mentioned application can be part of forthcoming commercial aviation.

Factors like purchase date, oil price, airline ticket price, flight distance, competition, airline reputation and more. The airline fare market is almost as complex as the corporate financial market. Obviously, it's a great claimant for AI-based algorithms to optimize price points to provide better revenue management. Commercial aircraft maintenance is a complicated aspect. Commercial aircrafts are always on the move around the country to country and the mechanical parts are not easy to move around. Hence, commercial aviation has to meticulously plan their maintenance schedules. Any unplanned maintenance can result in flight cancellations and delays. And this goes very expensive to commercial aviation. This has led commercial aviation to use AI-based predictive analytics to examine the maintenance needs of various parts of an aircraft. These tools can predict failure before it happens. It can save millions for the commercial aviation industry. The commercial aviation industry is reliant on a complex network of staff working together. Missing crew members, including pilots, flight attendants and engineers, etc., can have ripple effects. Rescheduling a crew member isn't simple. Numerous factors like certificates, qualifications, availability, and scheduling conflicts need to be resolved. This can be solved by utilizing AI based systems. Affordable IoT devices are helping the commercial aviation industry to take advantage of creative solutions for in-flight entertainment system. For example, IoT LEDs and microphones attached to the uniforms of the crew members. The LED displays provide information like flight number and emergency guidance. The microphones help the crew to directly communicate with passengers, etc.

Due to large number of users in wireless environment communication paradigm also have shifted to the concept of Cognitive Radio Networks [6, 7] for better utilization of wireless spectrum. Needless to say, the advancement in

handheld equipment and tremendous popularity of mobile application leads to necessity of timely analysis and security provisioning of communication environment. As we know that Miami International Airport has already implemented an IoT based information system that uses 500 beacons for indoor navigation. The system provides passengers with directions to their designated direction of departure gate.

2. PASSENGER CENTRIC SYSTEM (PCS)

Passenger centric system (PCS) can be possible using AI, IoT and Cloud. In this PCS, all service can be established to keep passenger's need in upmost priority base and centric. Like,

1) Putting passenger first,
2) Real time information about situation and centralized information through all touch point,
3) Personalized solution to traveler's problem,
4) Empowering travelers with intelligent re-accommodation,
5) Pro-active communication by commercial airlines and
6) Proper airport system management for the crew members

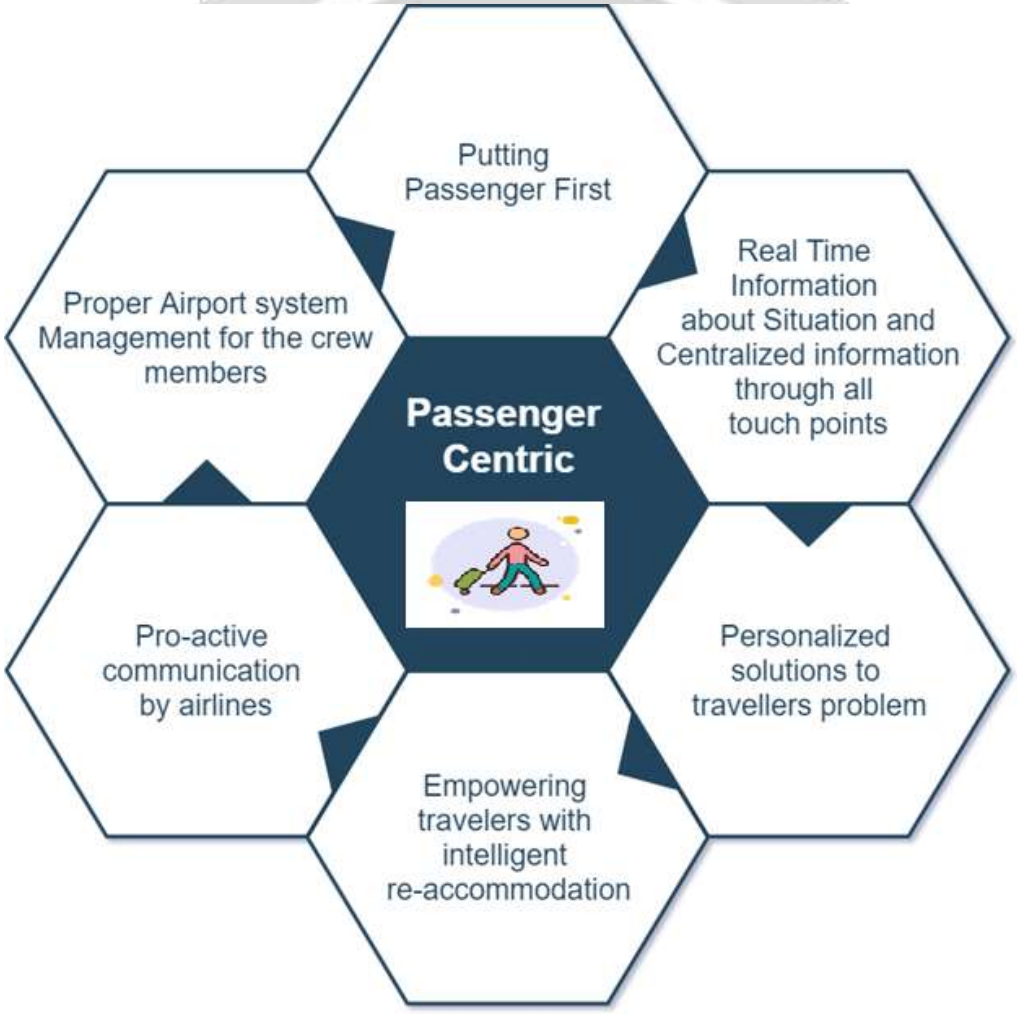

Fig -1: Passenger Centric System

Figure-1 depicts all segments, which take place in passenger centric system at commercial aviation. This can be done using artificial intelligence (AI), Internet of Things (IoT) and cloud technology. Forthcoming commercial aviation cover all above mention segment in new system and service.

2.1 Why forthcoming commercial aviation need this PCS?

As we know, at present commercial aviation and passenger faced many issues during the journey of passenger. Below we mentioned issues which faced by current commercial aviation and passengers.

1) Confused Passenger

Fig-2: Confused Passenger

Many passengers face issue while reaching at any new airport, as he/she unaware about the place, services and way to board aircraft at new airport. Because of confusion, delay take place and probability increase to missing flight. PCS can avoid this delay and provide proper navigation to passenger.

2) Passengers engaged in discretionary activities

Fig-3: Engaged Passenger

Many Passengers un aware about flight departure schedule during discretionary activities at airport. This mistake lead to missing flight. Proper notification system requires to avoid this mistake. PCS can do this to avoid this mistake.

3) Long Queues could be exhausting

Fig-4: Log Queues and Crowd

Sometime delay can be taking place due to long queues at the time of entering in airport, during security check, during boarding pass collection and many more things. This can be happened because of limitation of manual system. PCS can provide unique solution to overcome this issue.

4) Non-Personalized Experience

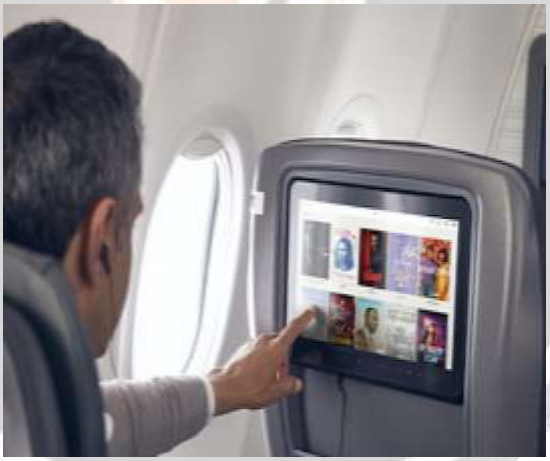

Fig-5: Non-Personalized Experience

Many passengers face issue inside the aircraft, for using In-flight Entertainment system (EFES). Passenger unaware about the features of IFES or have less experiences to use IFES. PCS can resolve this issue by recommendation feature based on AI.

There are many other reasons are there to prove that "Why Forthcoming commercial aviation will adopt AI, IoT and Cloud based system". Like late comers, announcement ignoring passengers, etc.

2.2 Process of PCS

There are three main technologies (AI, IoT and cloud). Using these technologies, Passenger centric system can be possible. Here we show characteristic for PCS. On basis of these characteristics, our PCS works.

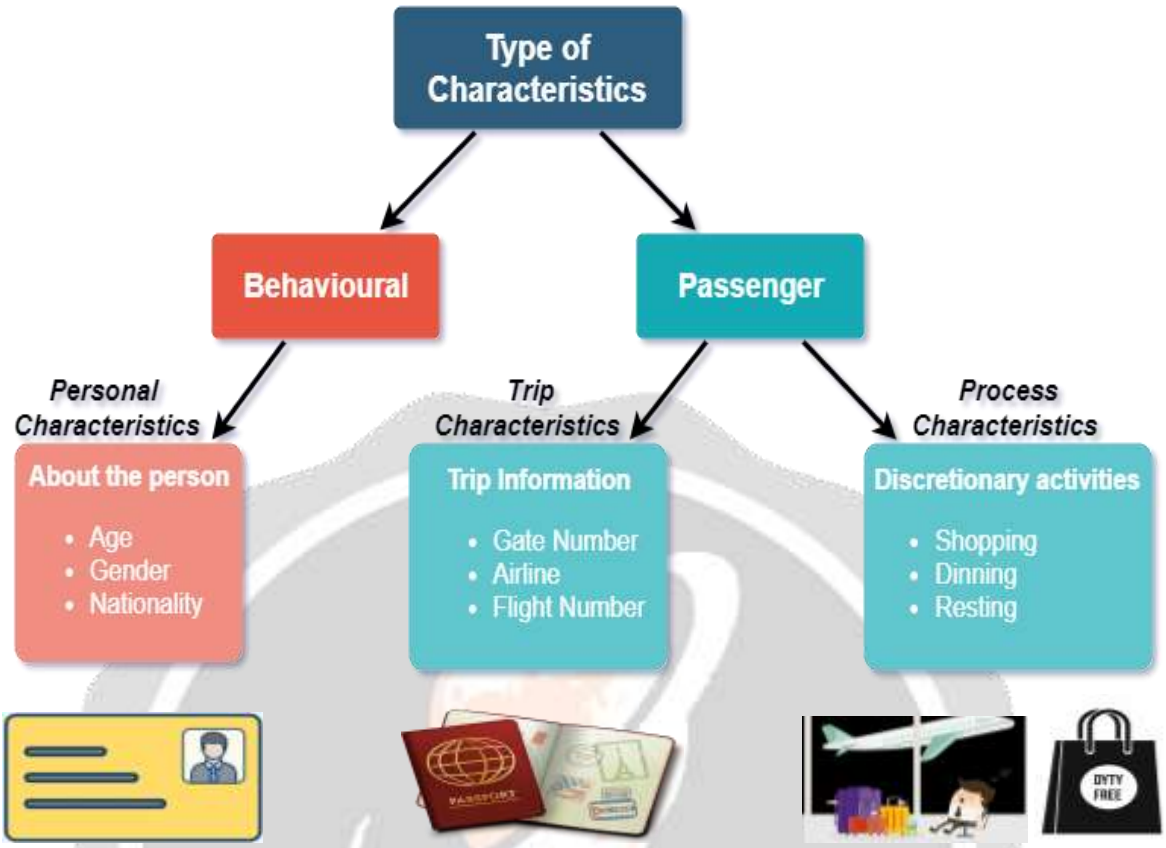

Fig-5: Characteristic

There are two main characteristics to collect information about the passengers are Behavioral and Passenger. Further these two characteristics have sub parts. Personal characteristic comes under the behavioral, where trip characteristic and process characteristic comes under the passenger.

Using personal information, we can categorize activities of passengers. It can be categorized in different group, age wise, gender wise and nation wise. Using trip information and discretionary activities, we can create notification, navigation and scheduling feature for passengers. All this information take place in AI based PCS. Using this predictive feature also take place and it will overcome issue, which passengers and commercial aviation faces at present.

2.3 Data Collection

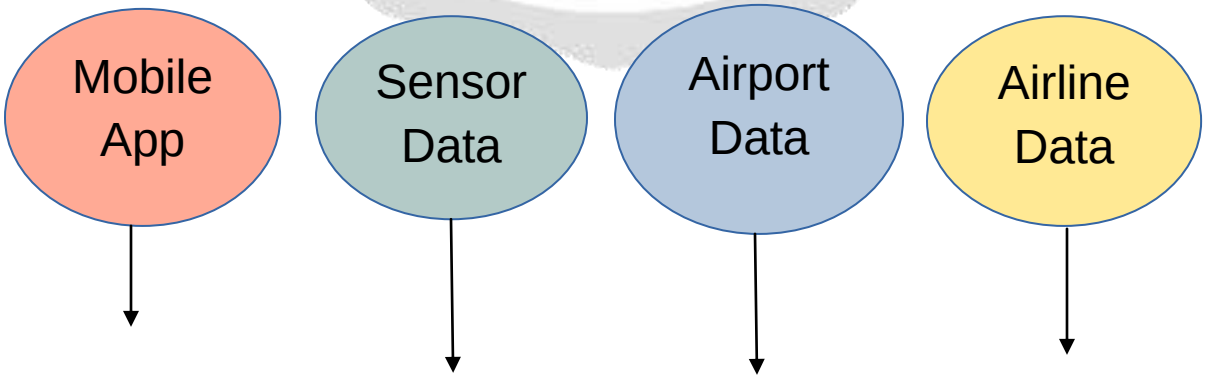

Fig-6: Data Collection

As data is key in AI based system and our Passenger centric system (PCS) using this AI. Figure-6 depicts various data point, from where data can be gathered. Passenger's mobile device provide lots of data, which help full to analysis behavior of passenger. IoT based commercial aviation have many sensors to established digital services at airport, which also help in data collection. Airport data itself take part in AI based system to forecasting various things. There are many airlines take part in this, like Jet Airway, Indigo, King fisher, etc. Various airlines provide various data, which also help full in analysis.

2.4 Solution Structure

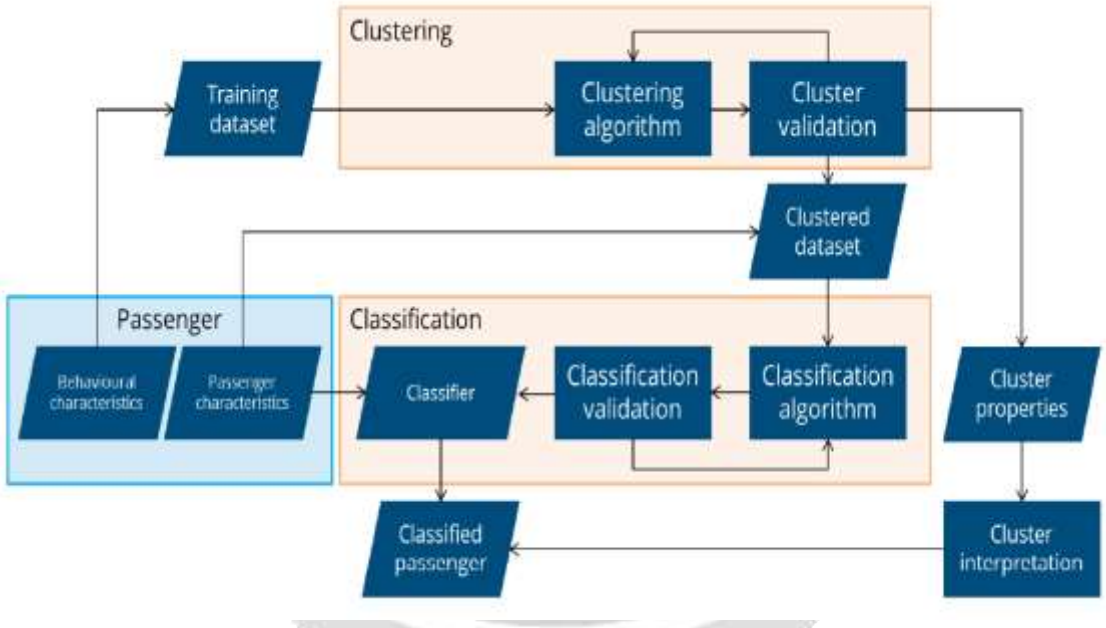

Fig-7: Solution Structure

Figure-7 depicts solution structure for this passenger centric system (PCS). Classification and clustering algorithm can be taken place in this PCS. Using this solution structure and available gathered data, PCS can be identified age group. Nationality, gender, passenger preference, etc. And on basis of this predictive analysis feature can be worked. Only AI, IoT and cloud-based system can overcome issues, which present in current system of commercial aviation.

Example:

Below mentioned approach can be help full in In-Flight-Entertainment system. Mentioned approach help full to overcome Non-personalized experience of passenger.

Content based filtering and Collaborative filtering:

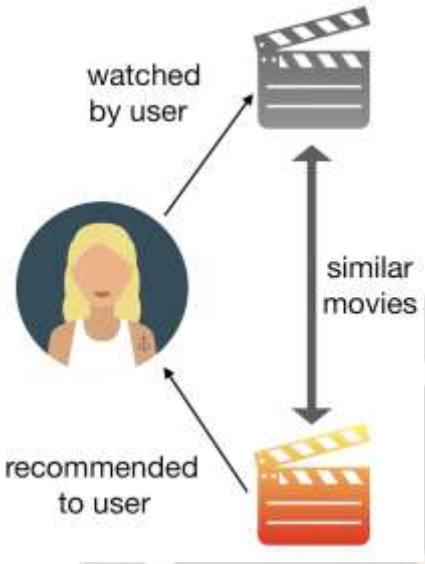

Fig-8: Content Based Filtering

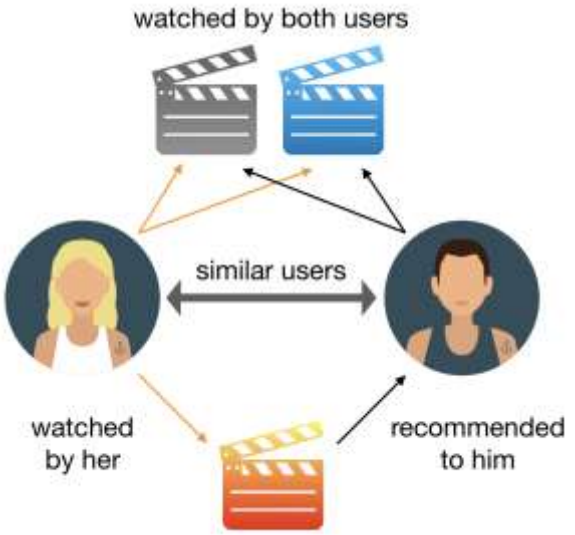

Fig-9: Collaborative Filtering

Content based filtering can be recommended most trending content, similar content which watched previously. Collaborative filtering can be recommended similar content, which access by similar age group, similar nation group, etc.

2.5 Advantages to commercial aviation and passenger.

Table -1: Advantages over Current System

Sr. No.	Advantages
1	Replaces manual system management and reduces regular workload for crew members.
2	Reputation would not be spoiled due to passengers' negative feedback.
3	Gaining customers loyalty.
4	Reduce in compensating cost to passenger's loss.
5	Easy access of information to passengers.
6	Personalized experience.
7	On-time Notifying system.

3. CYBER RISKS

Cyber risks are major concern in successful implementation of any AI, IoT or cloud-based system. Security and privacy are two major aspect while approaching this passenger centric system (PCS). Three phase authentication mechanism establishes effective security and privacy from various types of Cyber risks (Like, Trapdoors, Trojans, DDoS, Backdoors, etc.). Proposed authentication mechanism secures all over premises of commercial aviation including aircraft [2]. As we are collecting data in every stage of passenger's touch point, so security and privacy risk take place in AI based passenger centric system (PCS). To overcome this cyber risks, 3-phase authentication mechanism can be fruitful. Proposed mechanism in paper [2] by author is phase wise (1st Phase: Entire commercial aviation premises, 2nd Phase: Inside the airports and 3rd Phase: Inside the aircraft).

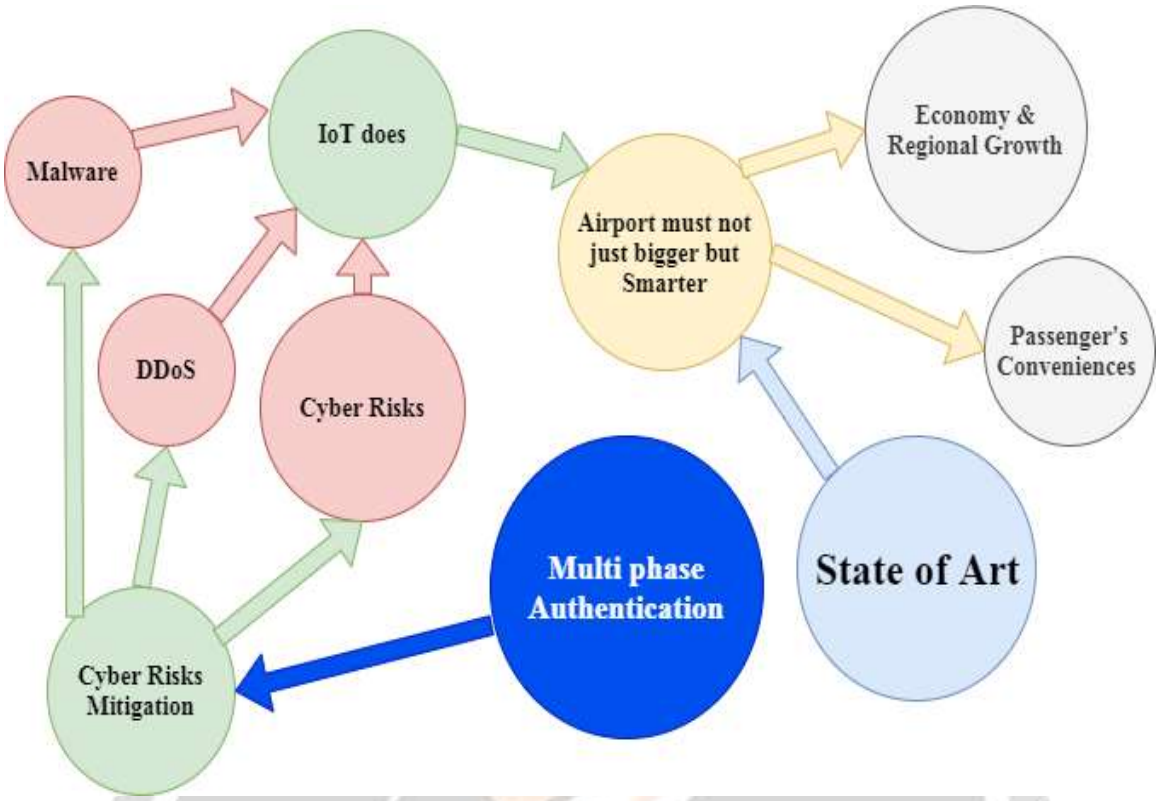

Fig-10: State of Art (Risk Mitigation)

Forthcoming commercial aviation will not just bigger but smarter. Because of advance aviation, economy and regional growth will be increase as well as passenger conveniences come in priority base. AI, IoT and cloud does this in forthcoming commercial aviation. Cyber risks, malware, DDoS are the critical concern while forthcoming aviation take place. Proper cyber risk mitigation mechanism can only open door for future commercial aviation demand. 3-Phase authentication mechanism proposed by author in paper [2] can avoid these cyber risks in forthcoming commercial aviation.

4. CONCLUSIONS

In this paper, we take review on forthcoming commercial aviation. Future commercial aviation will be AI, IoT and cloud-based, where cyber risks is major concern and hurdle in successful implementation of any AI, IoT or cloud-based system in commercial aviation. So, it is necessary to established strong cyber risk mitigation mechanism before establishing any AI, IoT or cloud-based system in forthcoming aviation. AI can replace old manual system and establish passenger centric system, IoT can establish fast and effortless services, cloud can provide easy access to data and many more thing possible, as we discussed previously in this paper but need more attention to successful implementation of digitalization in forthcoming commercial aviation.

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