Literature Review

This deliverable is the first part of the summative assessment and feedback from this submission will help you in the focus and direction of the main report and project implementation. The purpose of this submission is to demonstrate your understanding of the wider issues related to the project through an extensive literature review. The literature review should provide justification of your project and set the context by discussing and critically evaluating the past and current relevant literature sources. The review should conclude with a summary highlighting the main gaps and opportunities discovered and proposing the future direction of the research/ implementation.

The Literature Review will be graded based on the following aspects (the grading grid is available in Appendix C and on moodle.)

* Relevance and quality of sources
* Use of academic references
* Analysis of context and consideration of alternatives
* Evidence of systematic review of appropriate sources of information
* Evidence of critical appraisal of techniques and practices used in previous research or professional practice
* Evidence of organisation of an clear argument
* Summary of literature review and presentation of research question
* Overall presentation and structure

**Titles Sections**

Background

Flight Tracking Technology

ADS-B

MLAT

Comparison of ADS-B and MLAT

Flight Tracking Application Programming Interface

OpenSky Network

FlightAware

Augmented Reality

Metro AR google WebGL or WebJL globe

Chrome experiments

Amcharts

Usability Concepts

User Experience

Desirability

Comparison of Features and Design

The aim of this review is to research into flight tracking technology, how augmented reality aids in user experience, the use of augmented reality in other fields of mobile applications, and techniques used to assist in usability of mobile applications. It also compares current flight tracking mobile applications and critically evaluates relevant features with the study of reviews.

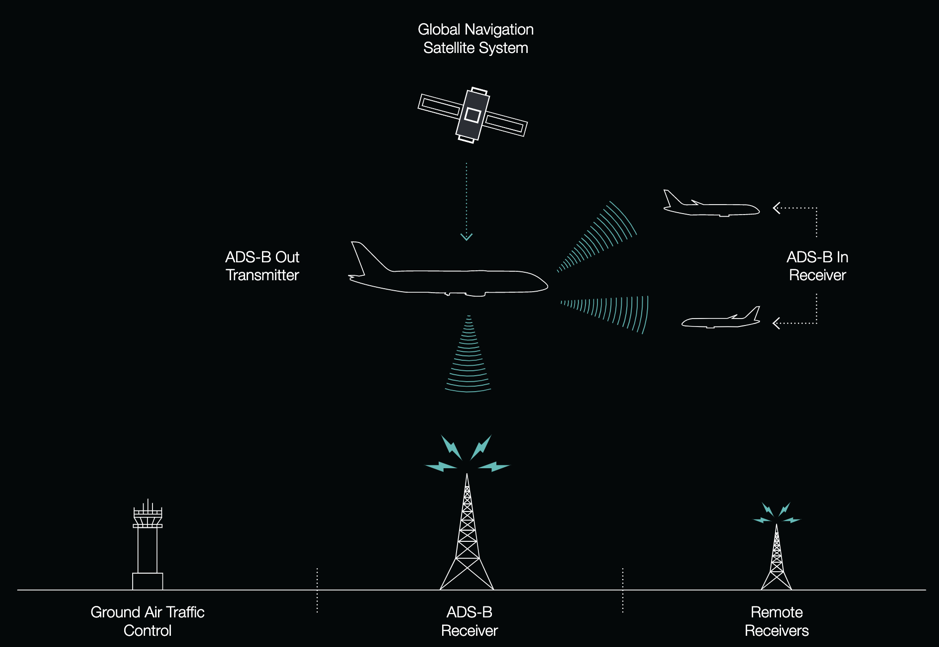
* 1. Flight Tracking Technology

The technology behind flight tracking comes from combining multiple data sources such as ADS-B and MLAT. This data is combined with aircraft schedules and statuses of flights which are acquired from airlines and airports. Newer aircraft such as all AirBus models, Boeing models between 737-787 are equipped with Automatic Dependent Surveillance-Broadcast (ADS-B) transceiver whereby it transmits signals containing data about the flight such as location, altitude etc. (“How flight tracking works - Learn how we track flights | Flightradar24,” n.d.) The data is transmitted at a frequency of 1090 MHz with a transmitting pulse length of 120 μ s allowing for data to be received by anyone/network with the appropriate ADS-B receivers. (Huang, Narayanan, & Feinberg, 2008) Older aircraft which are not equipped with the newer ADS-B transceivers can be located by calculating their position using Multilateration (MLAT). This uses a method called the Time Difference of Arrival which measures the time a signal is received from an aircraft using an older transponder, the ModeS, whereby the position can then be calculated. (“How flight tracking works - Learn how we track flights | Flightradar24,” n.d.) The literature will convey the benefits and disadvantages of the data receivers to convey which one is better suited to retrieve flight data or if a combination of the two is more beneficial.

1.1.1 Automatic Dependent Surveillance-Broadcast (ADS-B)

Air Traffic Management systems will face considerable challenges over the coming decades due to rapid growth in air traffic and demand. America alone excepted in 2015 for air traffic to increase by 25-30% and in some cases exceed that prediction. (Huang et al., 2008) Modernisation of flight tracking has been gradual with places such as western China beginning to consider ADS-B tracking due to restrictions of terrain and meteorological conditions preventing construction of new radar stations. (Zhang, Liu, & Zhu, 2011) Developed countries/continents such as Europe, United States, Australia, Canada and others are beginning to enforce/drive ADS-B as a mandatory requirement on aircraft by 2020 (“How flight tracking works - Learn how we track flights | Flightradar24,” n.d.) within their respective airspace making ADS-B data sources favourited by tracking applications for future data retrieval due to the drive to expand the network world-wide. (“ADS-B: 2019 & Beyond,” n.d.) ADS-B is a composition of CNS/ATM (Communication, Navigation and Surveillance/Air Traffic Management) and the recommended surveillance method by the ICAO (International Civil Aviation Organisation) for the future generation of ATM.

With use of ADS-B air traffic control will change from a radar-based system into a satellite-derived location system. The change will increase safety as aircraft will no longer rely solely on ATC as aircraft will have surveillance of other aircraft. (*Part III Department of Transportation Federal Aviation Administration 14 CFR Part 91 Automatic Dependent Surveillance-Broadcast (ADS-B) Out Performance Requirements To Support Air Traffic Control (ATC) Service; Final Rule mstockstill on DSKH9S0YB1PROD with RULES3*, 2010) This surveillance will greatly improve a pilot’s situational awareness of the traffic environment due to data of location and bearings being transmitted by aircraft in close proximity. (Huang et al., 2008) Additionally from this change brings enhanced accuracy and speed of data beneficial for precise flight positioning for tracking applications. (*Part III Department of Transportation Federal Aviation Administration 14 CFR Part 91 Automatic Dependent Surveillance-Broadcast (ADS-B) Out Performance Requirements To Support Air Traffic Control (ATC) Service; Final Rule mstockstill on DSKH9S0YB1PROD with RULES3*, 2010)



*Figure 1: How ADS-B works* (Richards, O’Brien, & Miller, 2010)

Although many clear advantages of ADS-B for airlines related to safety and fuel efficiency, from more direct routings, (Richards et al., 2010) airlines such as JetBlue Airways are difficult to persuade due to historic tendencies to not invest in technologies unless a compelling safety and business case is given. (“Unlocking the Benefits of ADS-B In - Aviation Today,” n.d.)

However due to the lesser cost of older technologies and current global infrastructure ADS-B lacks the overall worldwide coverage its counterparts have established.

Benefits and disadvantages of ADS-B

ADS-B system is an ideal vehicle for the success of this approach. The aircraft which is equipped with ADS-B-out system determines its own position using a global navigation satellite system and periodically broadcasts this position and other relevant information not only to possible ground stations but also to other aircraft that are equipped with ADS-B-in system. Therefore, the aircraft equipped with ADS-B-in system can receive the positions of all the nearby aircraft equipped with ADS-B-out system

References

Figures

Figure 1: How ADS-B works (Richards et al., 2010)