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AMSS IN EUROPE

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Abstract

Nowadays, technology is developing rapidly, therefore satellite and aviation systems need to keep pace with modern trends and new technology. The paper is focused on satellite systems and aviation systems. Based on analysis of the issues it is possible to take measures against problems that may arise in the future. There is a need for satellite-based navigation system that can solve the problems of the existing systems and make the existing systems better and more efficient by providing great convenience to the airspace users for the safe, efficient, comfortable and economical realisation of flights in the future. The paper contains information about Air Communication and Navigation Systems and discusses the state of current aviation and satellite systems.

Keywords

Aeronautical mobile-satellite service, AMSS, Navigation

1. Introduction

Technology is developing rapidly today, and air transport has managed to become a sector that can adapt to developed technology. Estimates suggest that 4 billion passengers travel by air each year and that this number will more than triple in the next 20 years. Therefore, measures are needed to solve existing issues in order to be able to meet the forecast demand. Current plan is to provide air navigation and communication services via satellite in order to meet the increasing air traffic demand and to solve the problems that may arise due to congestion and delays (Bilen et al., 2022).

The use of satellites in air navigation and communications services was first proposed in mid 1980 by Brian O'Keeffe of the Australian Civil Aviation Authority. Brian O'Keeffe proposed the use of satellite communications, Controller/Pilot Data Link Communications, Global Positioning System, Inertial Reference System and Automatic Dependent Surveillance technologies for improved monitoring and control in Air Traffic Control Centres (Chen & Xiong, 1994).

After that with the study initiated by the International Civil Aviation Organisation (ICAO) in 1983, the inadequacies of the existing systems were revealed. According to the results of the committee reports prepared at the 10th Air Navigation Conference held in 1991 satellite-based technologies were approved to overcome these inadequacies (Chen & Xiong, 1994).

Nowadays, system analysis are ongoing in the USA and Europe within the framework of the forecasts created to increase the capacity of the airspace by using satellite systems and to ensure more efficient use of the airspace. At the same time, the cost/benefit analyses and economic development of satellite systems are being evaluated (Chen & Xiong, 1994).

There is a need for satellite-based navigation system that can solve problems of the existing systems and make the existing systems better and more efficient by providing great convenience to the airspace users for the safe, efficient, comfortable and economical realisation of flights. Satellite based navigation systems should be economical, effective, efficient, productive and safe. Studies focused Satellite Air Navigation Systems are developing rapidly under the auspices of ICAO with the contributions of the United States of America, European countries and other Civil Aviation Organisations.

It can be potentially difficult to adapt to new technology systems that are developing rapidly every day. The transition from existing systems to new technologies is certainly not an event that can be realised in a short time. In order for satellite systems to gain integrity all over the world, global planning must be made. Regional and national studies are necessary in order to determine the regional differences of each place in the world and the inadequacies of the existing system. These studies are carried out by regional planning groups within the air navigation regions established by ICAO (Abo-Zeed et al., 2019).

2. Characteristics of AMSS

Aeronautical mobile-satellite service (AMSS) is a type of satellite communication service that is specifically designed for use in the aviation industry. This service allows aircraft to communicate with ground stations and other aircraft through the use of satellites, providing a reliable and efficient means of communication for the aviation industry (Zhang, 2021).

In Europe, AMSS has become increasingly important as a means of communication for both commercial and military aircraft. The EU has recognized the importance of AMSS in the aviation industry and has taken steps to ensure that this service is widely available throughout the region. One of the main benefits of AMSS in Europe is that it allows for real-time communication

between aircraft and ground stations. It is particularly important for commercial airlines, which rely on constant communication with ground stations in order to maintain safe and efficient operations. For example, with AMSS pilots can communicate with air traffic control to receive updated weather and flight information, which can help them to make more informed decisions about the best route to take (Abo-Zeed et al., 2019).

In addition to commercial airlines, military aircraft also benefit from AMSS in Europe. Military aircraft often operate in remote or hostile environments, where traditional forms of communication may not be reliable. With AMSS, military aircraft can communicate with ground stations and other aircraft in real-time, which is essential for maintaining operational readiness and carrying out effective missions (Morioka et al., 2020).

The EU has also recognized the importance of AMSS in terms of safety and has taken steps to ensure that this service is widely available throughout the region. The EU has established regulations and standards for AMSS, which are designed to ensure that the service is reliable, secure, and efficient. For example, the EU has established regulations for the use of AMSS frequencies, which ensure that there is no interference between different users of the service. In addition, the EU has also invested in the development of new technologies for AMSS, such as the use of satellite based navigation systems. These systems, such as the European Geostationary Navigation Overlay Service allow aircraft to determine their position and speed with a high degree of accuracy, which is essential for safe and efficient flight operations.

Despite the benefits of AMSS in Europe, there are also challenges that need to be addressed. One of the main challenges is that AMSS is a relatively expensive service, which can make it difficult for smaller airlines and aircraft operators to afford. Additionally, there is also a need to ensure that the service is secure and that communications are protected from unauthorized access or interference.

Aeronautical mobile-satellite service (AMSS) is a type of satellite communication service that is specifically designed for use in the aviation industry. This service allows aircraft to communicate with ground stations and other aircraft through the use of satellites, providing a reliable and efficient means of communication for the aviation industry. However, there are several problems associated with the propagation of satellite signals that can affect the performance of AMSS in Europe (Koga et al., 2014).

One of the main problems with the propagation of satellite signals is the effect of atmospheric conditions on the signal. The atmosphere can cause signal attenuation, which is the reduction of the signal strength as it travels through the atmosphere. This can be caused by various factors such as rain, snow, and atmospheric gases, which can all absorb or scatter the signal. This can result in a weaker signal reaching the aircraft, which can affect the quality of the communication and even cause it to be lost completely. Another problem with the propagation of satellite signals is the effect of the earth's surface on the signal. The earth's surface can cause signal reflections. This can cause signal interference, which can affect the quality of the communication. For example, if the signal is reflected off water or a large building, it can cause the signal to be delayed or distorted, resulting in poor communication quality. Additionally, the problem of signal blockage can also affect the performance of AMSS in Europe (Bilen et al., 2022).

Signal blockage occurs when a physical object such as a building, mountain or even a large aircraft blocks the line of sight between the satellite and the aircraft. This can cause the signal to be lost completely, resulting in a loss of communication. There are also problems associated with the use of frequency bands for AMSS. The frequency bands allocated for AMSS are shared with other communication services, such as mobile telecommunications and weather radar. This can lead to interference between the different services, which can affect the performance of AMSS. To mitigate this problem, the European Union (EU) has established regulations and standards for the use of AMSS frequencies, which aim to ensure that there is no interference between different users of the service (Koga et al., 2014).

AMSS is a type of satellite communication service that is specifically designed for use in the aviation industry. This service allows aircraft to communicate with ground stations and other aircraft through the use of satellites, providing a reliable and efficient means of communication for the aviation industry. However, one of the main problems with AMSS in Europe is the limited coverage area provided by the current satellite systems. One of the main challenges in providing AMSS coverage in Europe is the vast geographical area that needs to be covered. Another problem with the coverage area of AMSS in Europe is the limited number of satellites that are currently in operation (Kovacikova et al., 2022).

The current satellite systems used for AMSS in Europe are not able to provide coverage to the entire region, leaving some areas without access to the service. This can be particularly problematic for aircraft operating in remote or sparsely populated areas, where traditional forms of communication may not be available. The current generation of satellites used for AMSS are geostationary satellites, which means that they are positioned in a fixed location relative to the Earth's surface. The signal from these satellites can be blocked by the terrain, such as mountains or tall buildings. This can result in a weaker signal reaching the aircraft or even a complete loss of signal, which can affect the quality of the communication (Abo-Zeed et al., 2019).

In addition to the coverage area, the availability of the service is also a problem with AMSS in Europe. The service is dependent on the satellites being operational and in good working condition. If a satellite were to fail, it would result in a loss of service in the area covered by that satellite. This can be particularly problematic for aircraft operating in remote or hostile environments, where traditional forms of communication may not be available. The cost of providing AMSS coverage can be high, particularly in areas where the terrain and climate make it difficult to provide consistent and reliable coverage. Additionally, the cost of maintaining and upgrading the equipment and infrastructure required for AMSS can also be high. This can make it challenging for airlines and aircraft operators to keep their systems up-to-date and ensure that they are operating at optimal performance (Ilcev, 2019).

3. Analysis of AMSS

An analysis of AMSS in Europe can provide a comprehensive understanding of the strengths, weaknesses, opportunities, and threats associated with the service.

3.1. Strengths

AMSS allows aircraft to communicate with ground stations and other aircraft through the use of satellites, providing a reliable and efficient means of communication for the aviation industry. This is particularly important for aircraft operating in remote or hostile environments, where traditional forms of communication may not be reliable (Ilcev, 2019).

AMSS can provide coverage worldwide, which is crucial for the aviation industry that operates on a global scale. AMSS can improve safety by allowing pilots to communicate with ground control and other aircraft in real-time, which can help to prevent collisions and other accidents (Koga et al., 2014).

AMSS can be more cost-effective than other forms of communication, such as VHF radio, which can save airlines and aircraft operators money.

3.2. Weaknesses

The current satellite systems used for AMSS in Europe do not provide coverage to the entire region, leaving some areas without access to the service. This can be particularly problematic for aircraft operating in remote or sparsely populated areas. The service is dependent on the satellites being operational and in good working condition. If a satellite were to fail, it would result in a loss of service in the area covered by that satellite. This can be particularly problematic for aircraft operating in remote or hostile environments.

The cost of providing AMSS coverage can be high, particularly in areas where the terrain and climate make it difficult to provide consistent and reliable coverage (Sedláčková et al., 2020).

3.3. Opportunities

AMSS can increase efficiency and safety in the aviation industry by allowing pilots to communicate with ground control and other aircraft in real-time, which can help to prevent collisions and other accidents (Morioka et al., 2020).

The EU has been working on the development of new technologies to improve the coverage area of AMSS such as the use of Low Earth orbit satellite, which are positioned closer to the earth and can provide a more consistent and reliable coverage area (Morioka et al., 2020).

AMSS can provide a reliable means of communication for aircraft operating in remote or sparsely populated areas, where traditional forms of communication may not be available.

3.4. Threats

Other satellite systems, such as GPS and GLONASS, may provide similar services as AMSS and can be a threat to the adoption of AMSS. AMSS can be affected by interference from other communication systems, which can affect the performance of the service (Ilcev, 2019).

The implementation of AMSS in Europe is dependent on the support and funding from the EU and ESA and it represents political and regulatory challenges (Tropea et al., 2022).

4. Best practices for safety

One of the best practices for safety in AMSS in Europe is the use of satellite-based navigation systems. These systems, such as the European Geostationary Navigation Overlay Service (EGNOS), allow aircraft to determine their position and speed with a high degree of accuracy, which is essential for safe and efficient flight operations. Additionally, these systems can also provide information on weather conditions and other hazards, which can help pilots to make more informed decisions about the best route to take (Ilcev, 2019).

Another practice for safety in AMSS in Europe is the use of secure communication systems. The safety of AMSS depends on the ability to communicate reliably and securely. This is particularly important for military aircraft, which often operate in remote or hostile environments, where traditional forms of communication may not be reliable (Tropea et al., 2022).

By using secure communication systems, aircraft can communicate with ground stations and other aircraft in real-time, which is essential for maintaining operational readiness and carrying out effective missions (Nair & Kirthiga, 2022).

The use of redundant systems can increase the safety of AMSS in Europe. This means having multiple systems in place to ensure that communication can still take place even if one system fails. This is particularly important for aircraft operating in remote or hostile environments, where traditional forms of communication may not be available. By having redundant systems in place, aircraft can continue to communicate even if one system fails, which can help to ensure the safety of the aircraft and its passengers (Nair & Kirthiga, 2022).

Regular maintenance and inspections of the equipment and infrastructure used for AMSS ensures safety of these systems in Europe. This includes the satellites themselves, as well as the ground stations and other equipment used for communication. By regularly maintaining and inspecting the equipment and infrastructure, it is possible to detect and fix any problems before they can affect the performance of the service and cause safety hazards (Bilen et al., 2022).

Regular training of pilots and other personnel who use the service is crucial for safety. This includes training on the proper use of the equipment, how to troubleshoot problems, and how to respond to emergency situations. By providing regular training, it is possible to ensure that pilots and other personnel are prepared to use the service safely and effectively (Bilen et al., 2022).

Finally, the EU has established regulations and standards for AMSS in Europe, which are designed to ensure that the service is reliable, secure, and efficient. These regulations and standards cover areas such as the use of frequencies, equipment and infrastructure, and maintenance, which are crucial for ensuring the safety of the service. By adhering to these regulations and standards, it is possible to ensure that the service is being used safely and effectively (Novák et al., 2018).

5. Conclusion

In order to make flights safer, more efficient, comfortable and economical, it is understood that a satellite-based navigation system should be developed to solve the problems of the existing systems and make the existing systems better and more efficient by providing great convenience to the airspace users.

Aeronautical mobile-satellite service is a vital service in the aviation industry, providing real-time communication between aircraft and ground stations. The EU has recognized the importance of AMSS for the aviation industry and has taken steps to ensure that this service is widely available throughout the region. However, there are also challenges that need to be addressed, such as the cost of AMSS and the need to ensure that communications are secure.

In conclusion, the propagation of satellite signals is a critical aspect of the performance of AMSS in Europe. However, there are several problems associated with the propagation of satellite signals that can affect the performance of AMSS. These include the effect of atmospheric conditions, the effect of the earth's surface, signal blockage, frequency band interference, and the cost of the service. The EU has established regulations and standards for the use of AMSS frequencies to mitigate the problem of frequency band interference. However, more efforts are needed to address other issues such as signal blockage, cost and atmospheric condition to ensure the optimal performance of AMSS in Europe.

In conclusion, the coverage area is a critical aspect of the performance of AMSS in Europe. However, there are several problems associated with the coverage area of AMSS in Europe. These include the vast geographical area that needs to be covered, the limited number of satellites that are currently in operation, the limited availability of the service, and the high cost of providing coverage. The EU has been working on the development of new technologies to improve the coverage area of AMSS such as the use of Low Earth orbit satellite, which are positioned closer to the earth and can provide a more consistent and reliable coverage area. However, more efforts are needed to address other issues such as the high cost of providing coverage and the limited availability of the service to ensure that AMSS is widely available throughout the region.

In conclusion, the safety of Aeronautical mobile-satellite service in Europe is a crucial aspect that needs to be considered in the implementation of this service. By implementing best practices such as the use of satellite-based navigation systems, secure communication systems, redundant systems, regular maintenance and inspections, regular training and adherence to regulations and standards, it is possible to ensure that AMSS is being used safely and effectively. These best practices can help to ensure the safety of the aircraft and its passengers, as well as the overall performance of the service.

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