Chapter 4
Investigation of Aircraft and RPAS Data Traffic via Satellite Communication Channel

ABSTRACT

This chapter considers simulation of traffic in the transmission of ADS-B messages with the help of a low-orbit satellite complex Iridium. Different models of communication channel “Aircraft-Satellites-Ground Stations” were built using NetCracker Professional 4.1 software. Influence of aircraft and satellites amount on average link utilization and message travel time was studied for telecommunication channels with intersatellite link and bent-pipe architecture. The effect of communication channel “saturation” during simultaneous data transmission through a satellite communication channel from many aircraft was investigated. Influence of protocol type, size of transactions, time between transactions, and channel latency on traffic was studied. A method for estimation of traffic losses was proposed and dependencies of the data loss coefficient on the size of transactions were received.

INTRODUCTION

Data Exchange in Aviation Telecommunications

New times have come for aviation communications. Soon it will be basically a data exchange, and voice communication will be used in non-standard and emergency situations. The main emphasis in the development of aeronautical communications is now being made on functioning on a global scale.

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Globalization makes it possible to use channels more efficiently and provides sharing of opportunities by many users.

There are two main categories of aeronautical communications:

- Safety-related modes of communication that must have high integrity and speed: communication between the air traffic management bodies and the aircraft to provide air traffic control, the transfer of flight information, warning messages, and communication for the purposes of aeronautical operational control, implemented by aircraft operators to address issues related to safety, regularity and efficiency of operations;
- Non-safety-related modes of communication: aeronautical administrative communication, carried out by aviation personnel and/or aviation organizations for administrative and private matters; aviation communication for passengers.

In addition, for the transmission of surveillance data and data that provide better knowledge of the air situation, direct communication and communication in the broadcasting mode are used.

**Communication “Air – Ground”**

It is assumed that the regular air-to-ground communication during the flight phase along the route will basically be the exchange of digital data. In this case, the user selects a specific message from a pre-compiled list using the menu on the monitor screen, adds some specific parameters (or arbitrary text), and then sends the message. In some cases, data is transferred between automated airborne and ground systems without the need for manual intervention. Such an exchange of data, according to experts, will greatly reduce the amount of voice communication and, therefore, will reduce the workload of pilots and controllers. However, this does not mean that the voice communication will completely disappear. In busy, the use of voice communication is likely to continue to be preferred. In emergency or non-standard situations, voice communication will be maintained as the main air-ground connection.

Air-ground messages are transmitted over one of the following radio links:

- AMSS (Aeronautical Mobile Satellite Service): Geostationary communication satellites designed specifically for mobile communications provide near-global coverage and voice and data communication channels. AMSS is used for aircraft operating in
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