OVERVIEW OF PROJECT

Context

Transportation has taken many forms in the last one hundred years with air transport being one of the most prominent and relevant ways to carry both people and cargo all over the world in record time. As it happens with many sectors, air transport is in constant change and evolution as humans are always in the look of ways to make systems more efficient and safer both for themselves and earth. In the last century it has been seen that there is a decrease in the number of people required to operate an aircraft. While two pilots might have been enough for single or twin-engine small airplanes flying short missions over land, longer missions typically involved more engines, celestial navigation and erratic radio communications. With the technological development, machines have become increasingly suited to execute jobs that were previously occupied by humans with lower precision levels. As such, the number of people in the cockpit, necessary to conduct such long missions, got reduced to what we know today: a pilot and a copilot. Even though that is the reality in most transportation aircrafts, other types of aircrafts no longer require an on-board pilot thanks to the development in telecommunication and navigation technologies.

Objective

The project focuses on the Remote Piloted Aircraft Systems (RPAS) also known as Unmanned Aircraft Vehicles (UAV's) by reflecting an analysis on the interferences affecting it, since these are the possible future systems for transportation of merchandise and people. The main constraint is the establishment of a robust communication link capable of ensuring a constant control of the aircraft and also be able to fight against intentional or unintentional forms of interference. Nowadays the most advanced system is the American system (also known as terrestrial system), that uses ground stations to transmit between the remote pilot and the RPA. The goal is the design and verification of a robust link according to the specifications in the mentioned documents by attempting to improve the results achieved by the students working on this same project last year. This project was divided in the following stages:

1. Study of the C2 Link system
2. Study of the frame characteristics
3. Study of the intra-interference analysis of the C2 Link system
4. Generation of the propagation channel
5. Gathering of results

This is done to understand the system and the channel that would be modelled for the unmanned aircraft. Through this project we analyzed the desired to undesired signal to noise ratio plus interference in order to account for the worst-case scenario. Then, the losses that the electromagnetic wave is subjected to as it travels to the propagation channel is accounted for. This helps us to encode a link which follows the ITU-R P.2345-2 snapshot propagation channel model. We then compare the ITU-R P.2345-2 document with the DO-362A, more precisely in terms of how the Rice factor is calculated. The comparison is done to find out the assumptions taken from the ITU-R P.2345-2 to design a channel with required link parameters to obtain the results in the DO-362A. The results obtained from implementing different cases of polarization is analyzed and compared to the results in DO-362A. Besides that, a review was made on the last year student project where their method of generating the propagation channel based on the ITU-R P.2345-2 recommendations was altered/corrected in a way to reduce the error between the results present in the DO-362A and the generated propagation channel in MATLAB.