University of Victoria
Department of Electrical Engineering & Computer Science
ECE 350 – Communications Theory
Project Report
Fall Term 2021

Airplane Tracking using RTL-SDR Dongle and RTL1090

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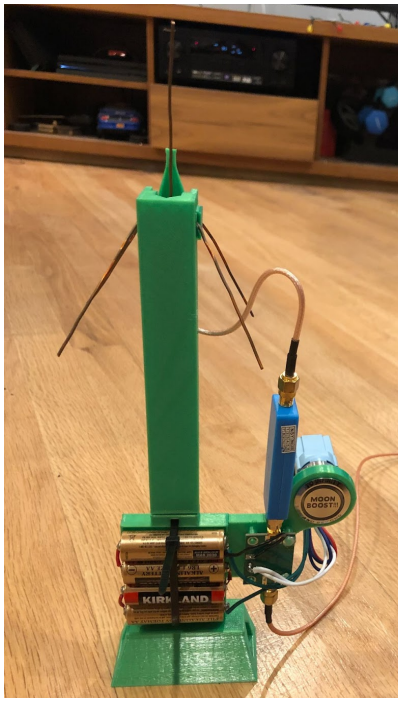
Description of Equipment Setup

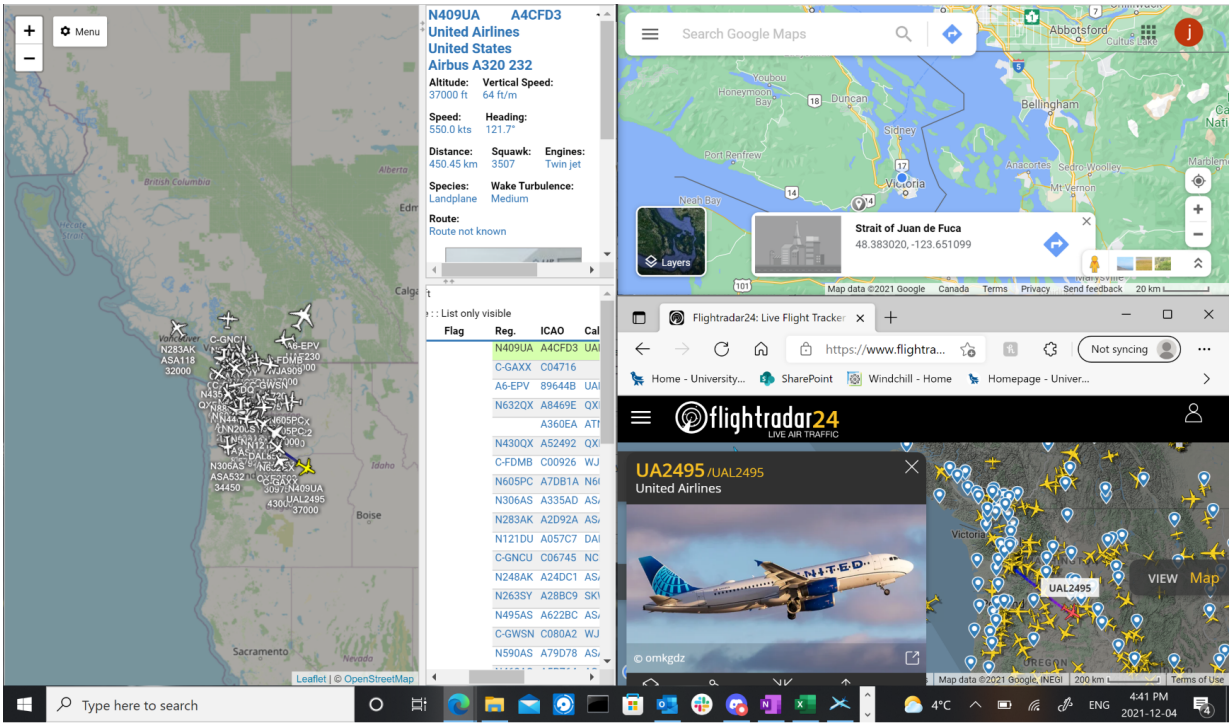
To track and locate aircraft at a maximum distance possible a 4 radial, quarter length dipole antenna was used, along with a bandpass filter, and low noise amplifier.



The ground radials and driven element are made from 1.25mm copper wire soldered to SMA bulkhead adapter. From here, a cable passes the received signal to a 1090 MHz bandpass filter. The Filtered signal is then put into a low-noise amplifier and then into the RTL-SDR dongle. The hardware for this design is housed within a green 3D printed structure. Then, using the RTL1090 software the received signal data is dumped into Virtual Radar where location, distance and other flight data regarding the aircraft is displayed. From trial and error the optimal antenna element lengths were found to be approximately 66mm for the ADS-B signals.

Results

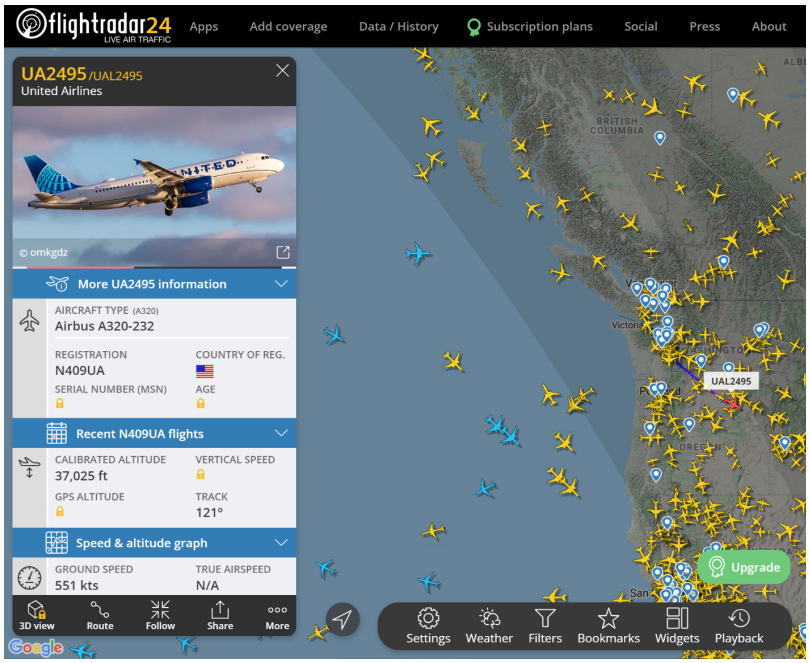
Below, a screenshot showing the location of the aircraft and receiver is provided. The location of the aircraft is determined using the Virtual Radar software which receives data dumps from RTL1090. The receiver location is set to mount Douglas on the Flight Radar map, this location is ensured using google maps (upper right window of the following image). Then the flight data is ensured using Flightradar24 (bottom right window of the following image). The distance to the aircraft is obtained from the Flight Radar window (left window of the following image).



The distance achieved with our setup from aircraft to receiver is: 450.45km.

Independent Verification of Location

The location is independently verified using Flightradar24. The time, registration, and flight number is listed below.



Time: 4:41PM (from previous image)
Flight Number: UA2495
Registration number: N409UA