Introduction

• Goals
  • To design a proof of concept device which will warn pilots of light aircraft that they are entering controlled airspace.

• Background
  • 3 types of controlled airspace in Ireland:
    • Control Zone (CTR)
    • Control Area (CTA)
    • Air Traffic Service Routes (ATS)
  • Airport Electromagnetic Transmission Systems
    • Communications (VHF Radio)
    • Surveillance (Radar)
    • Navigation Beacons (VOR - VHF Omni-directional Range)

• Implementation Overview
  • Initial simulation and prototyping using MICAz motes
  • Dedicated hardware capable of detecting VOR navigation beacon

Early Prototype

Simulate an aircraft and a VOR navigation beacon using MICAz motes.

• Determine range to transmitter using the Received Signal Strength Indicator (RSSI)
• Obtain the position using the GPS system on the MTS420cc sensor-board
• Calculate altitude from the pressure measured using the barometric pressure sensor.

TinyOS

Programmed in Networked Embedded Systems C (NesC)

• Component based language.
  • Interfaces
    • Specify commands and Events
  • Components
    • Modules
      • Implement commands and/or events
    • Configurations
      • Connect interface providers to interface users

Airspace Boundary Detector

• Dedicated Hardware
  • Detects VOR navigation beacon
  • Lights a warning LED before an aircraft crosses into controlled airspace

• Design an alarm circuit which will light a warning LED when an aircraft enters controlled airspace.

3 stage circuit

• Input
  • Antenna and Band-pass Filter
  • Power Measuring
    • LTC5507 RF Power Meter demo board
• Output
  • AZV 393 Voltage Comparator with LED warning light

Conclusions and Future Work

The Controlled Airspace Boundary Detector can prevent all airspace infringements. It will remove the risk of mid-air collisions in controlled airspace and prevent economic losses and delay’s due to temporary runway closures.

Future Work

• Replace the filter with a wider bandwidth filter.
• Integrate the entire system on a single PCB
• Mount the circuit in a suitable enclosure with power and coaxial antenna connection sockets.
• Design a control interface allowing a pilot to configure the system

References & Contact

• Definition of Controlled Airspace
  • Annex 2 to the convention on international civil aviation
    • http://www.icao.int
• Contact:
  • Email: postgraduate@scss.tcd.ie