

# SKYHAWK PROJECT OVERVIEW

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**Project Title: SkyHawk – GPS-Based Drone Detection and Communication Toolkit**

**Project Version: v1.0**

**Author: Pankaj Maurya**

**Project Type: Field-Deployable Embedded Security Tool**

**Power Source: USB Power Bank**

**OLED Display / Buttons / LEDs: Not included (headless design)**

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## Introduction

SkyHawk is a compact, USB-powered security and surveillance tool built for professionals in cyber-physical systems, penetration testing, and drone threat detection. It combines GPS tracking, GSM messaging, and 2.4GHz radio capabilities into a single field-ready embedded system using low-cost modules. The tool is designed to be highly portable, reliable, and easily deployable without requiring a user interface, screen, or buttons.

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## Objectives

- Detect movement and location using GPS
  - Communicate over GSM (SMS) for remote logging or alerts
  - Interface with 2.4GHz wireless modules for potential jamming, sniffing, or alert broadcasting
  - Use ESP32's capabilities for data processing and coordination among peripherals
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## Core Functional Modules

### 1. NEO-6M GPS Module

- Continuously tracks geographical coordinates
- Provides real-time location data to ESP32 via UART
- Used to geotag drone presence or sensor positioning

## 2. SIM800L GSM Module

- Sends SMS alerts with GPS coordinates to a predefined phone number
- Can be adapted to send encoded data or system status updates
- Operates via AT commands over UART

## 3. NRF24L01+ PA+LNA Wireless Module

- Communicates over 2.4GHz spectrum for long-range point-to-point or mesh networking
- Can be programmed to scan for RF signals, send alerts, or jam known control signals (research-only feature)
- Used for inter-device communication in distributed SkyHawk deployments

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### Hardware Components

Module	Description
ESP32 Dev Board	Main microcontroller (WiFi + Bluetooth + UART/SPI/I2C)
NEO-6M GPS	GPS Module with TTL UART output
SIM800L GSM	GSM/GPRS module (Micro SIM based)
NRF24L01+ PA+LNA	Long-range 2.4GHz transceiver with antenna
Power Source	USB Power Bank (5V stabilized)

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### Circuit Diagram

Refer to the attached file:

 wiring\_diagrams/circuit.png

All modules are connected directly to ESP32 with UART/SPI interfaces, using 3.3V or level-shifted signals for compatibility. Modules are powered from the 5V rail via regulator (if needed).

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### Software Architecture

Project is organized as:

SkyHawk/

└─ src/

		main.ino	→ Main control logic
		gps_module.h	→ GPS read/parse code
		sim800l_comm.h	→ AT command interface to SIM800L
		nrf_radio.h	→ NRF24L01 communication functions

ESP32 handles the orchestration between modules:

- Acquires GPS fix
- Sends SMS periodically or on trigger
- Uses NRF24L01 to broadcast location or receive RF commands

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## Key Features

- **Headless Operation:** Fully functional without screen or input buttons
- **Field Ready:** Can be deployed on rooftops, open fields, or vehicles
- **Real-time SMS Alerts:** GPS data sent via mobile network to remote operator
- **RF Interaction:** Can scan or interact with 2.4GHz spectrum
- **Modular Codebase:** Clean header-based structure for easy expansion

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## Limitations & Scope

- **Not a real-time drone detector** by itself; RF logic is simple and experimental
- **No persistent storage/logging** yet (can be added via SD card)
- Designed for **educational, research, or lawful security use only**

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## Future Enhancements

- Add SD card logging for GPS data
- Include MQTT over GSM or WiFi for real-time telemetry
- Develop WebUI or App-based interface for configuration
- Integrate Sub-GHz detection (e.g., CC1101)
- Add watchdog and power-saving mechanisms

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## Conclusion

SkyHawk demonstrates how combining low-cost modules and a powerful ESP32 can produce a versatile, compact, and customizable toolkit for cyber-physical and wireless research. It provides essential functionality for location tracking, remote alerting, and RF interaction in a rugged, buttonless design—perfect for field agents, ethical hackers, or researchers in drone surveillance.

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### Author Note

This tool was developed as part of an experimental hardware research line under the *NirvanaSec* initiative. Use responsibly, expand mindfully, and adapt creatively.

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### About the Creator

**Pankaj Maurya**, also known in the community as **CipherLok**, is a passionate cybersecurity analyst and red teamer from India. With years of hands-on experience in ethical hacking, wireless pentesting, and embedded systems, Pankaj bridges the gap between physical and digital security.

He's the visionary behind **NirvanaSec**, a spiritual-cyber fusion brand that creates tools like SkyHawk—not just for hacking, but for understanding the broader spectrum of digital freedom, awareness, and counter-defence.

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🏆 *Recognition: OpenAI Hall of Fame, VAPT expert, IoT Hacker*