Wireless Aerial Surveillance Platform

W.A.S.P.

DEFCON 19

Introduction

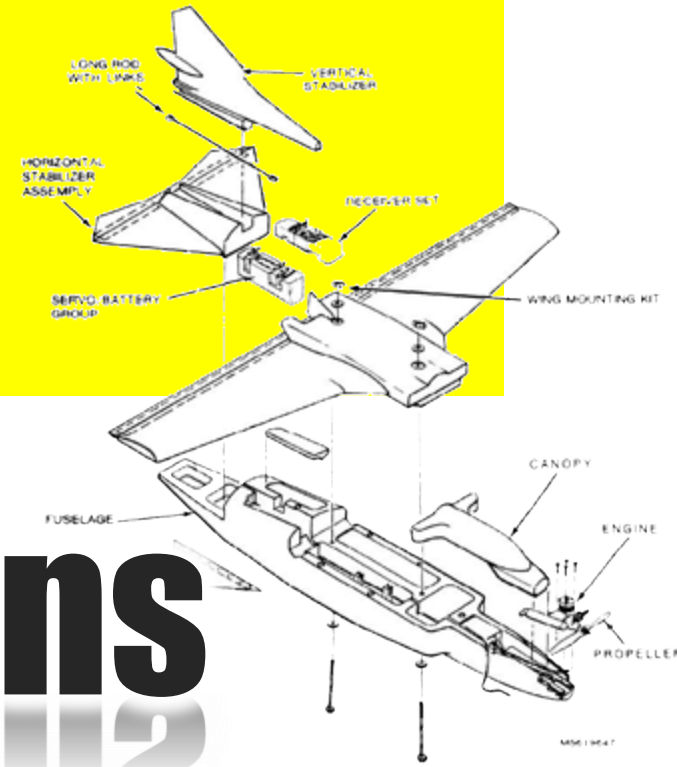
Who we are.

Project Inception - October 2009

- “Dude, I have an idea…”
  - Build a UAV
    - Provide remote penetration testing capabilities
    - Useable flight time (~1 hour)
    - Man portable
- Design Philosophy
  - Low cost
  - Utilize open source and off-the-shelf components
  - Focus on system integration not component design
  - Easily repeatable by anyone

Specifications

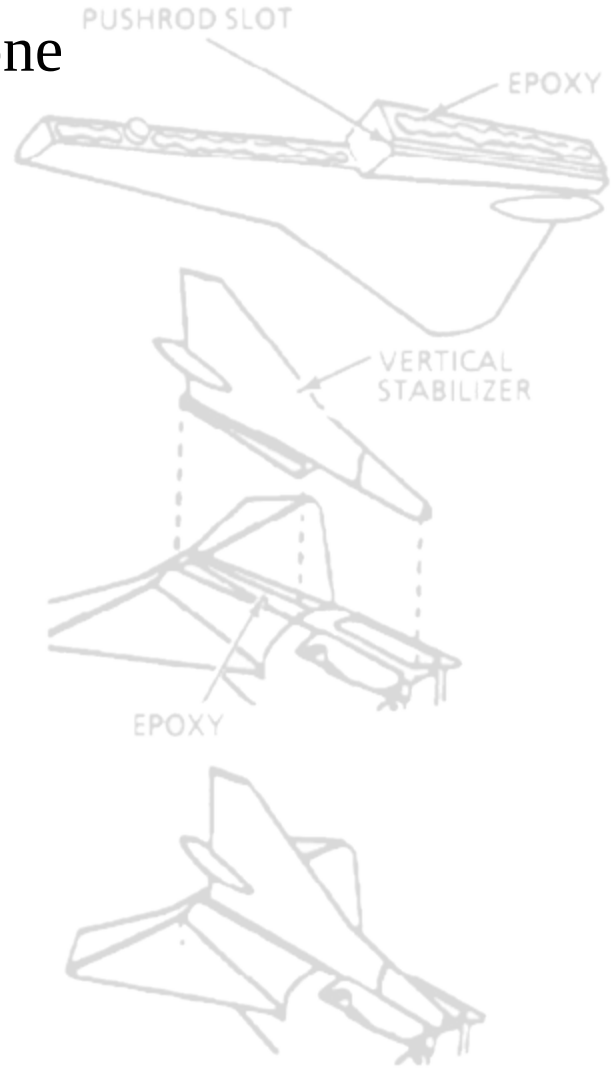
So what is it?

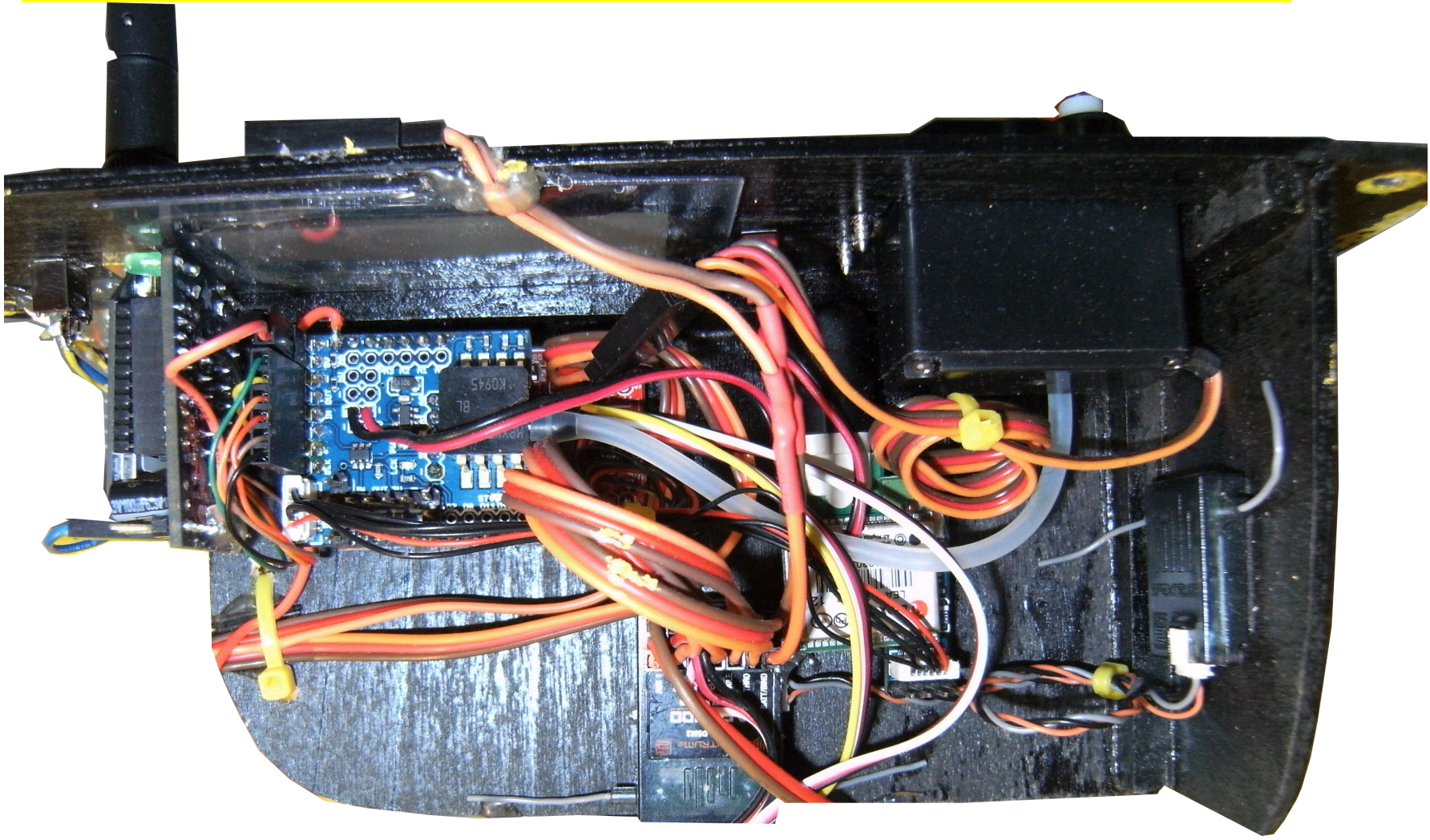


Airframe

Airframe

- FMQ-117B U.S. Army surplus target drone
  - Foam contruction
  - ~14 pound take-off weight
- E-Flite 90 brushless out runner motor
  - Castle Creations Phoenix 85HV ESC
  - 17”x10”electric propeller
- 2x 6 cell 22.2v 5000mAh LiPo batteries

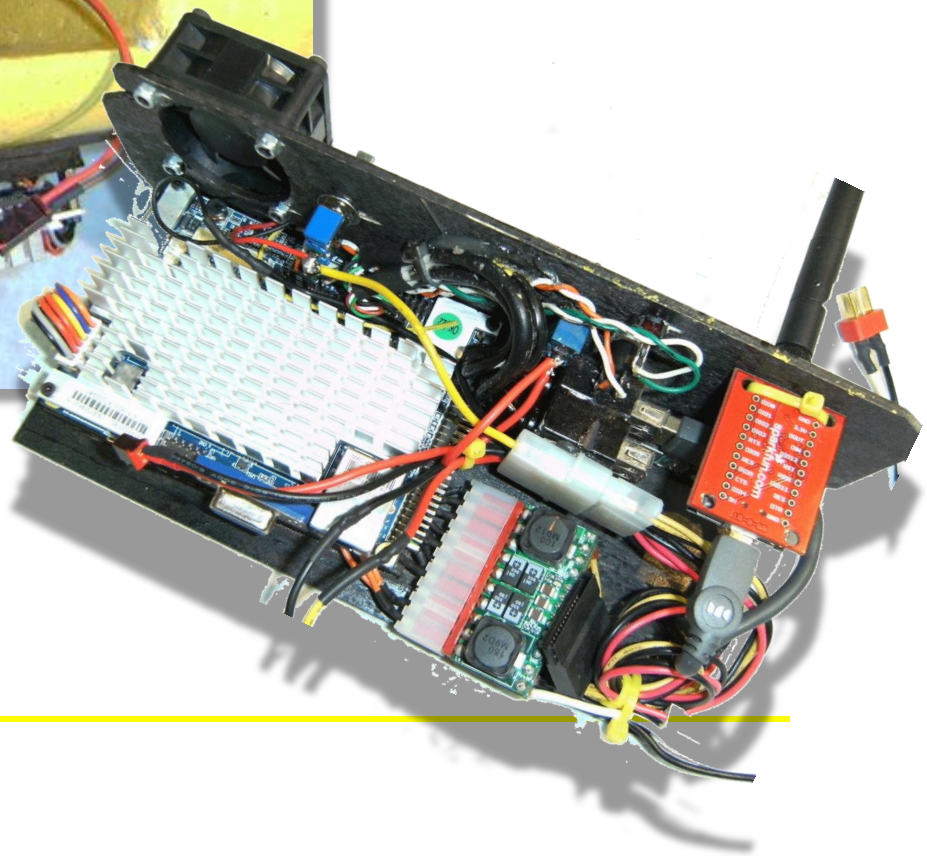




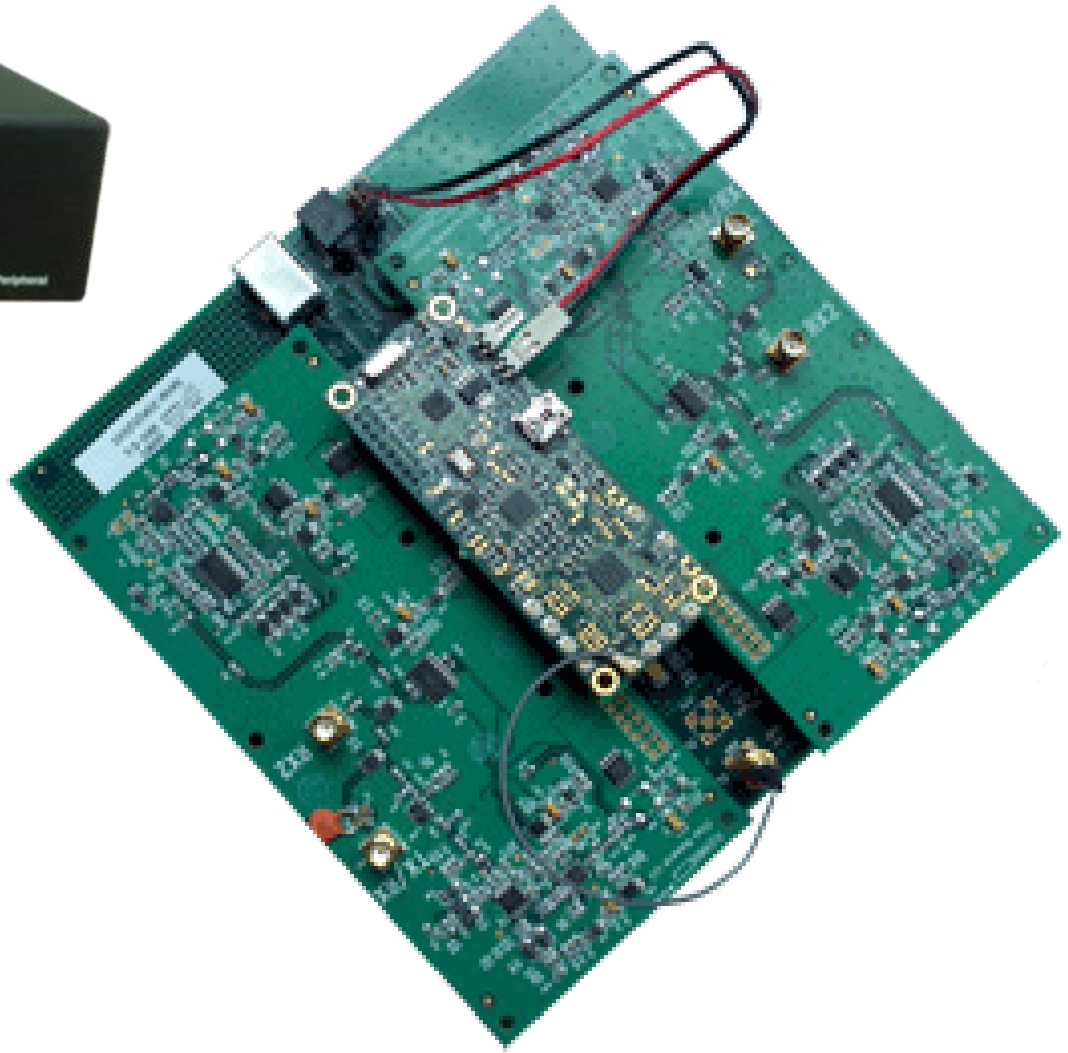
Avionics

- JR Spektrum Dx6i Transmitter and Receiver
  - 2.4GHz
- DIY Drones ArduPilot
  - ArduShield
  - XY&Z Infrared sensors
- Various servos
- XBee Pro with AdaFruit adapter
  - 900MHz
  - Telemetry downlink

Avionics



Payload



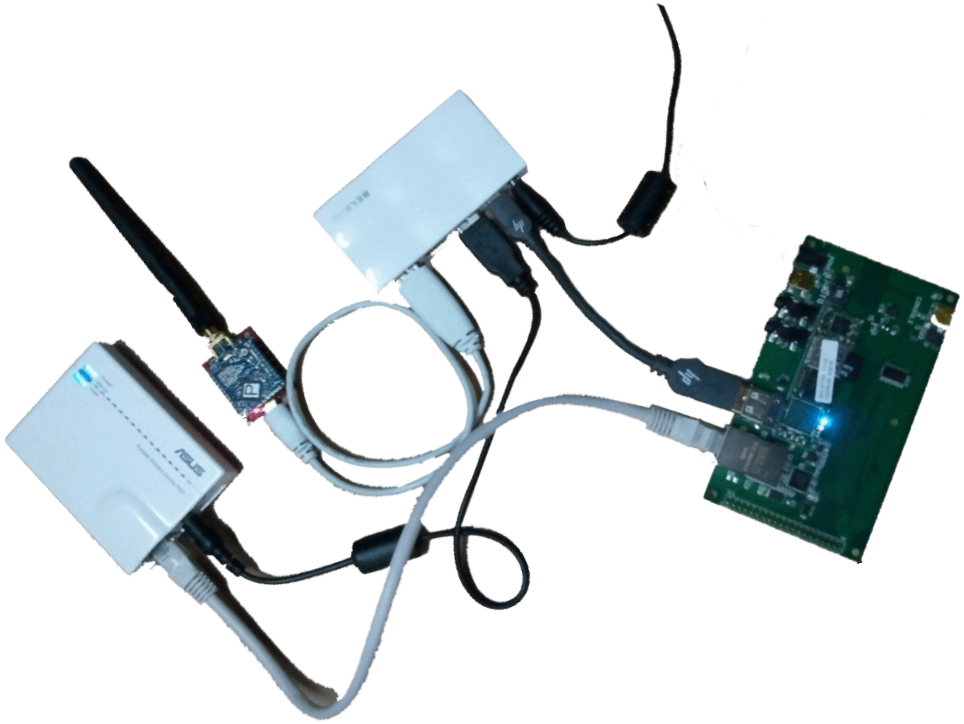
Payload

Payload

- Via Epia PX5000eg Pico-ITX motherboard
  - 1 GHz Via C7 CPU
  - 1GB ram
  - 8GB Voyager GTR Flash drive
  - Backtrack 5
- USB 4G dongle
  - Internet connection
  - OpenVPN connection to Backend
  - Session Initiation Protocol (SIP) back haul
- XBee Pro module
  - 900MHz
  - PPP tunnel to Base Station
- Universal Serial Radio Peripheral (USRP)

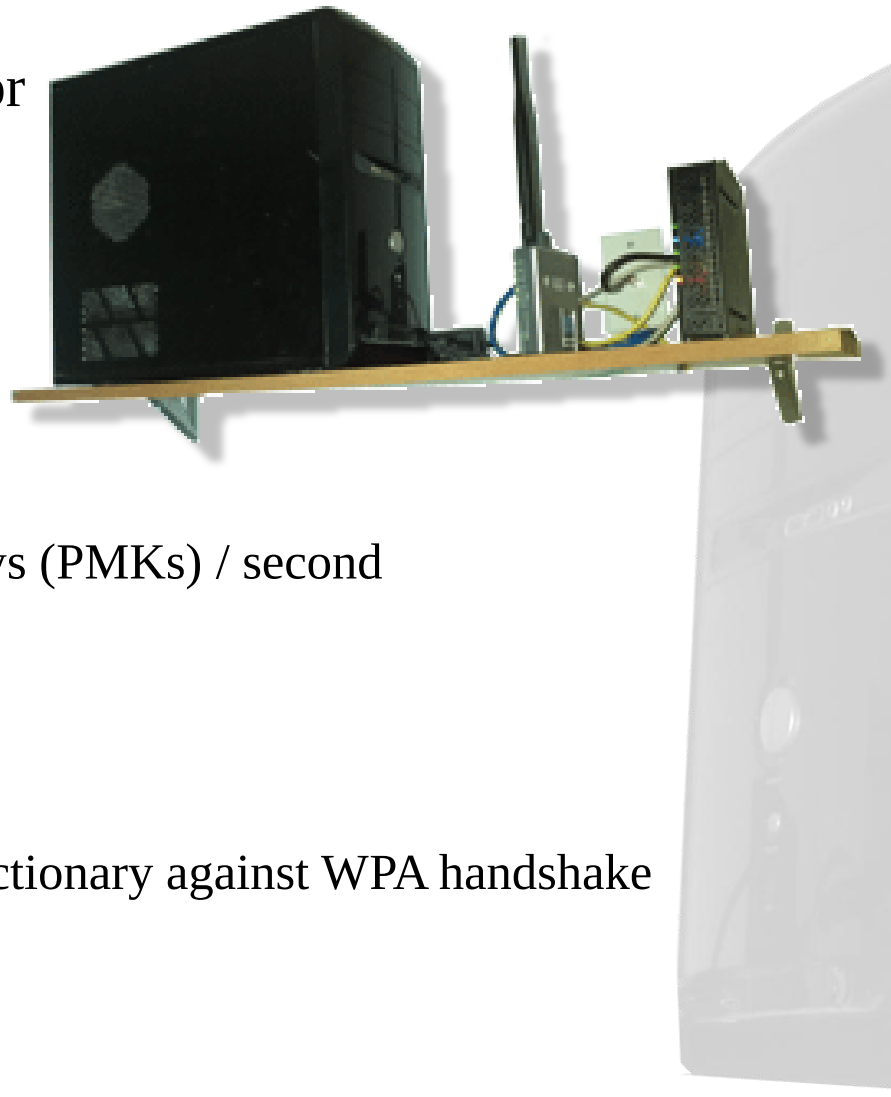
Base Station

Base Station



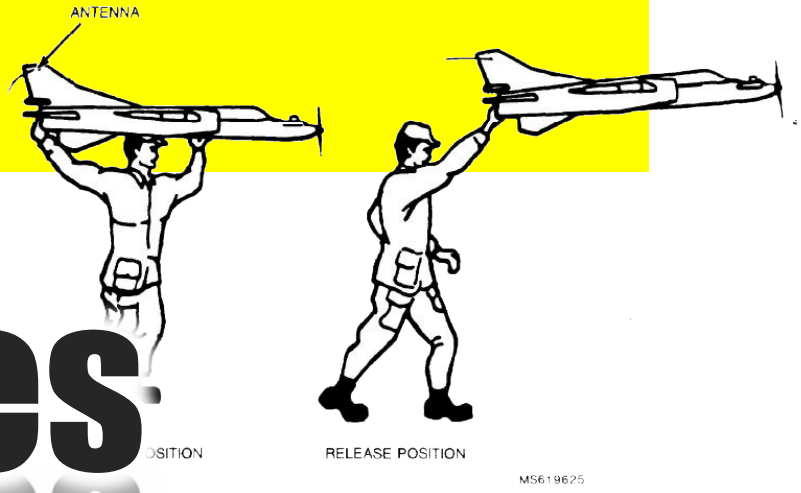
- Gumstix Overo Earth
  - ARM Cortex-A8 600Mhz
  - Chestnut43 add-on module
  - 4.3” touchscreen display
  - XBee Pro
    - 900MHz
    - PPP tunnel to the payload
- DIY Drones ArduStation
  - XBee Pro
    - 900MHz
    - Telemetry down-link from Ardupilot
- Asus WL-330gE Wi-Fi Access Point
  - Allows easy and direct access to payload

Backend

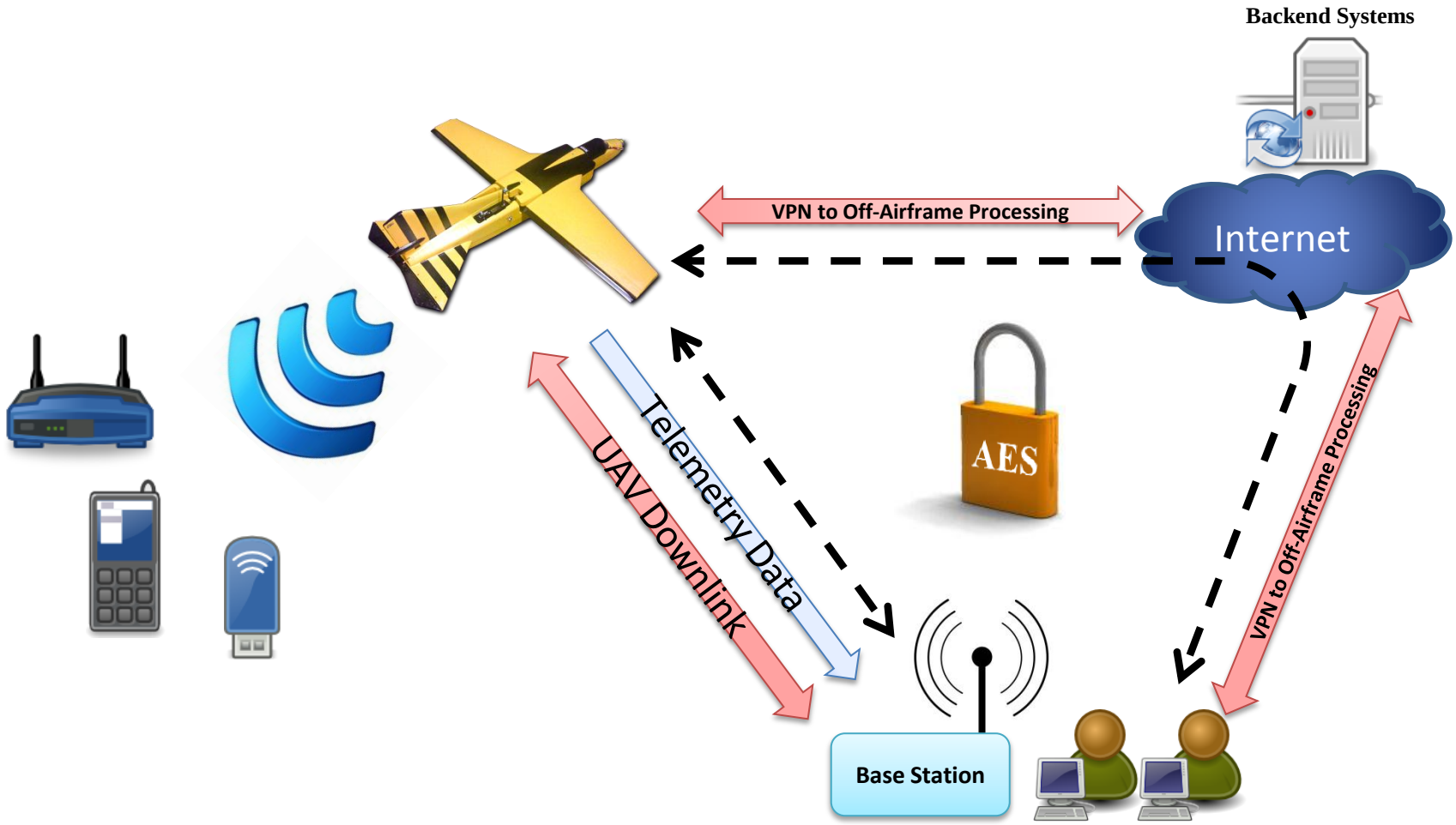


- Intel P4 3.06GHz HT Processor
- 4GB Memory
- 500GB Hard Drive
- NVIDIA GTX 470
  - CUDA Processor
- Software
  - Pyrit
    - ~19,300 Pairwise Master Keys (PMKs) / second
  - Asterisk
  - WPA Brute Force Dictionary
    - 4 GB
    - 354,638,643 Entries
    - 4.5 hours to process entire dictionary against WPA handshake
  - OpenVPN Server

Capabilities



Yes, but what does it do?



System Topology

Movie goes here

Capabilities

Capabilities

- Base station
  - Telemetry
  - Wi-Fi Accessibility
    - “WASP – Base Station” access point
- Backtrack 5 based payload
  - Kismet
  - Aircrack, Airbase-ng, all the BT5 tools
- Universal Software Radio Peripheral (USRP)
  - GNU Radio, OpenBTS
  - IMSI Catcher

Project Costs

How much is this going to cost me?

Aircraft

- Airframe Free
- Payload ~ $640
- USRP ~ $1600
- Avionics & R/C ~ $800
- Power-plant ~ $800

Base Station

- Gumstix Overo Earth ~ $350
- ArduStation ~ $100
- Wi-Fi AP ~ $50
- 7 port USB Hub $40
- Project Box ~ $10

Backend Station

- Generic x86 PC ~ $600
- NVIDIA Video Card ~ $300

Total Cost

Cost So Far	~$5960.00
+ Misc. Costs	~$500.00
Total Cost	**~$6190.00**

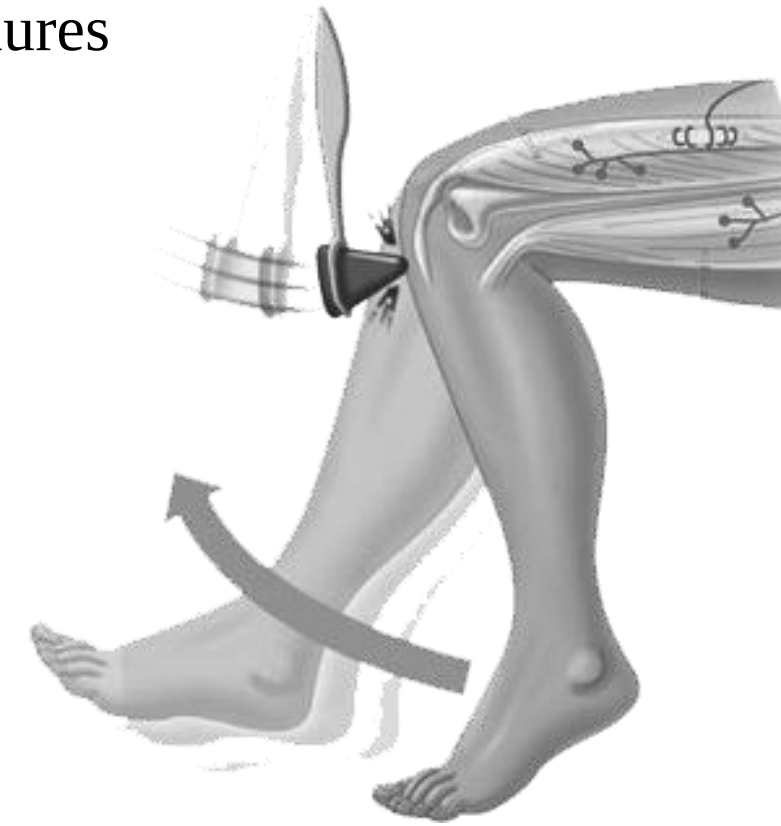
Not counting mistakes

Lessons Learned

Mistakes cost money.

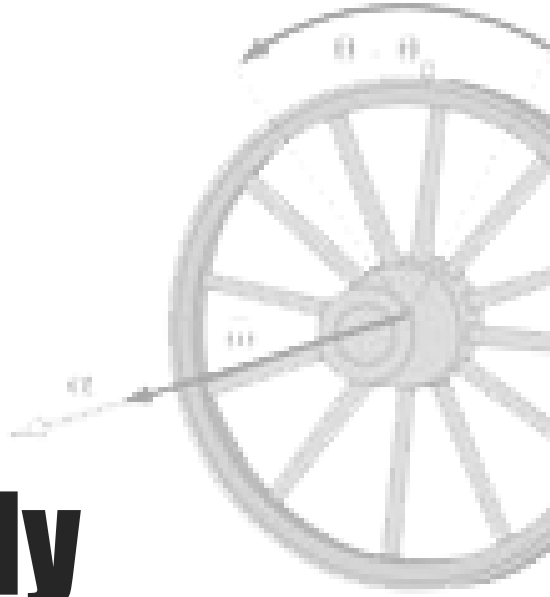
Save some by using ours.

- Looking ahead 3 steps or more
  - Poor choices today can limit tomorrow's potential
- You will crash, learn from your failures
- Good / Bad decisions
  - MIG vs. EasyStar
  - VIA Epia vs. ARM payload
  - Propeller size
  - Attitude sensor location



System Design vs. Knee Jerk Problem Solving

- This has no custom parts. Everything is easily available online
- The average enthusiast can build and operate this
- This is what we came up with, not the limit of possibilities



Utilizing what is already available

- People automatically assume you are an evil bastard trying to destroy their hobby / job / life
- Online communities can see you as a potential threat, so don’t expect a lot of hugs and kisses
- We received threats that we were going to be reported to the FAA, FCC, FBI, NSA, NAACP, AARP, GI-Joe, the Air Force, Air Traffic Control and our moms if we didn’t stop ruining it for everybody

This might not make you popular

The Reality Of It All

- It’s never as hard as it seems, or as easy as it looks
- Unforeseen issues take up time & money
- You will crash
  - Do not expect perfection the first time
- Cheap is a relative term

References

- Chris Paget's Defcon 18 "Practical Cellphone Spying" talk
  - https://www.defcon.org/html/defcon-18/dc-18-speakers.html#Paget
- DIY Drones – ArduPilot / ArduStation
  - http://www.diydrones.com
- Backtrack – Penetration Testing Tools Distribution
  - http://www.backtrack-linux.org/
- Basic Micro – Power Supplies
  - http://www.basicmicro.com/
- Gateway Electronics St Louis – Electronics & Components
  - http://www.gatewaycatalog.com/
- Gumstix – Ultra-small ARM based Computers & Accessories
  - http://www.gumstix.com/
- Horizon Hobby – R/C Supplies
  - http://www.horizonhobby.com/
- Sparkfun – Xbees, antennas and more
  - http://www.sparkfun.com/commerce/categories.php
- VIA – PICO-ITX motherboards
  - http://www.via.com.tw/en/initiatives/spearhead/pico-itx/

Special Thanks

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  - Editor Extraordinaire

- Our significant others
  - For being very understanding and putting up with countless hours spent not paying attention to them.

Questions?

https://www.rabbit-hole.org