DARPATech '99

Digital Radio Frequency Tags

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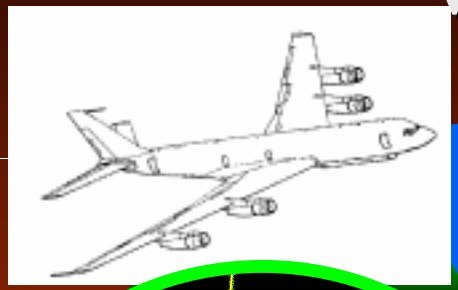
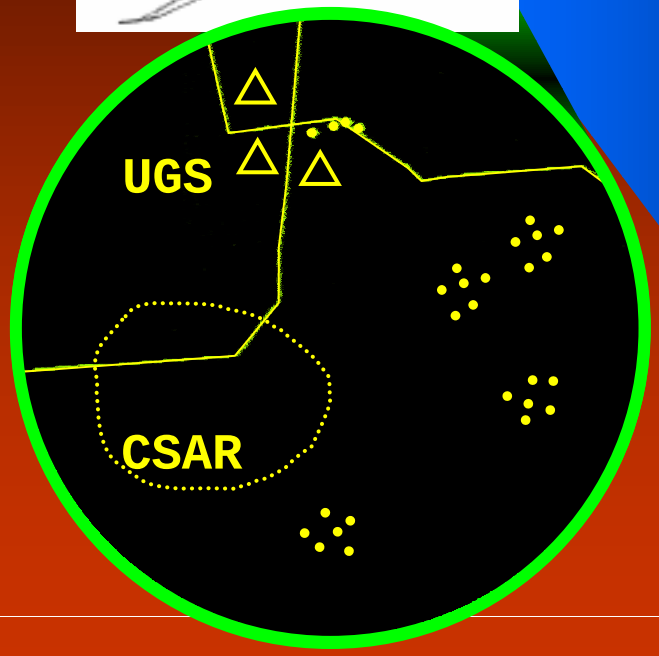
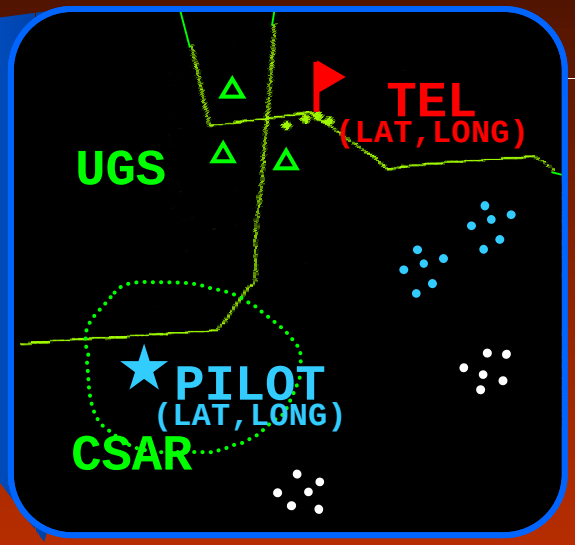
DARPA TTO

June 1999

Vision



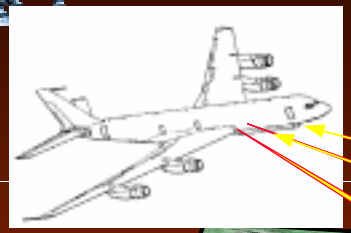


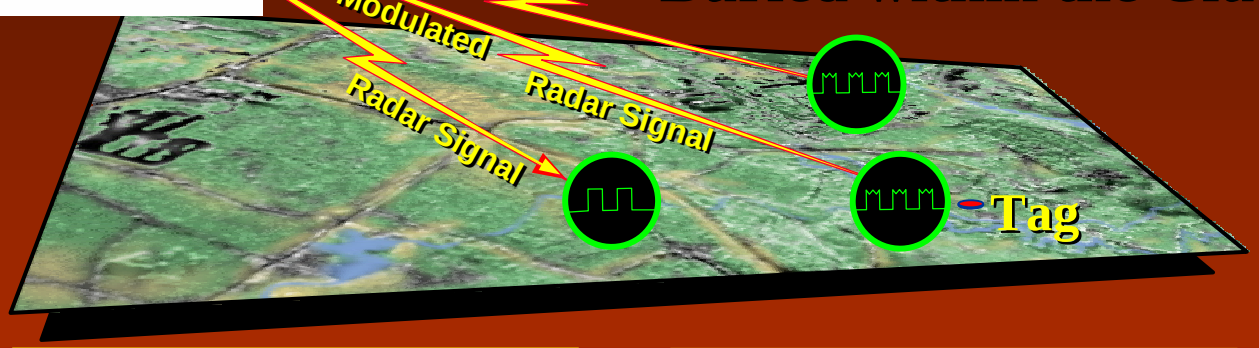


- Situational Understanding
- Secure Comms

Concept

- Info via Signal Modulation
- Buried within the Clutter





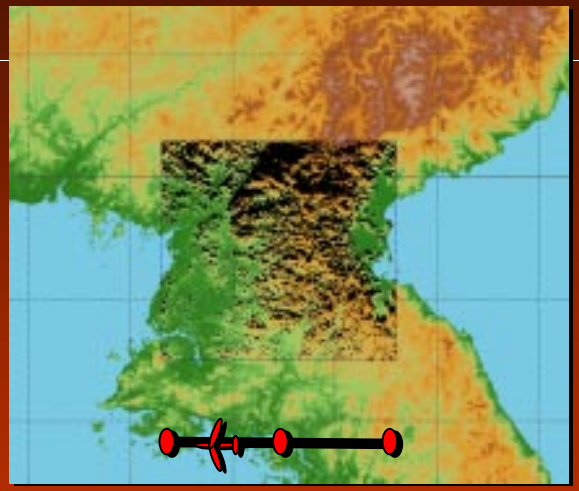
SAR Image

Tag Image

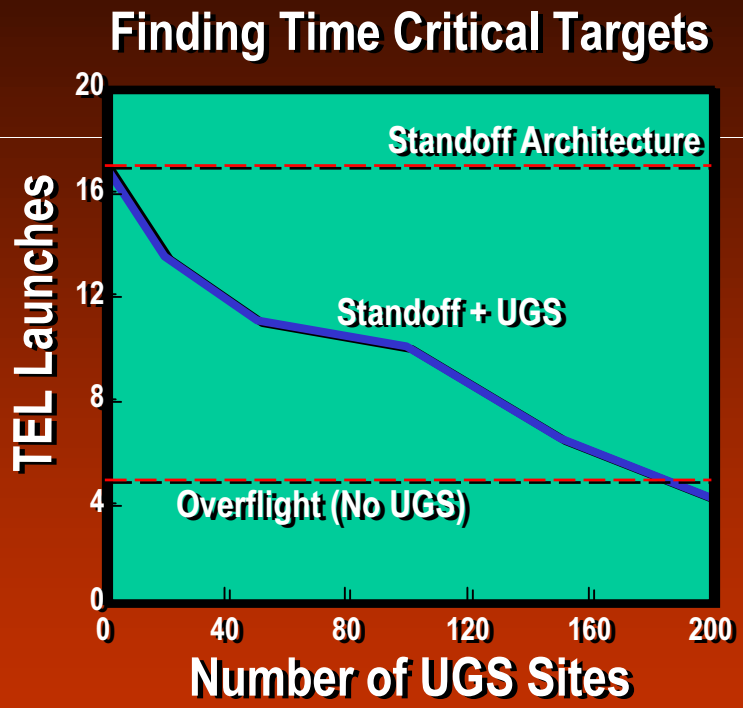
Mission Areas

- Unattended Ground Sensors (UGS) Connectivity
- Blue / Coalition Force Monitoring
- Combat Search and Rescue / Special Operations

UGS Connectivity

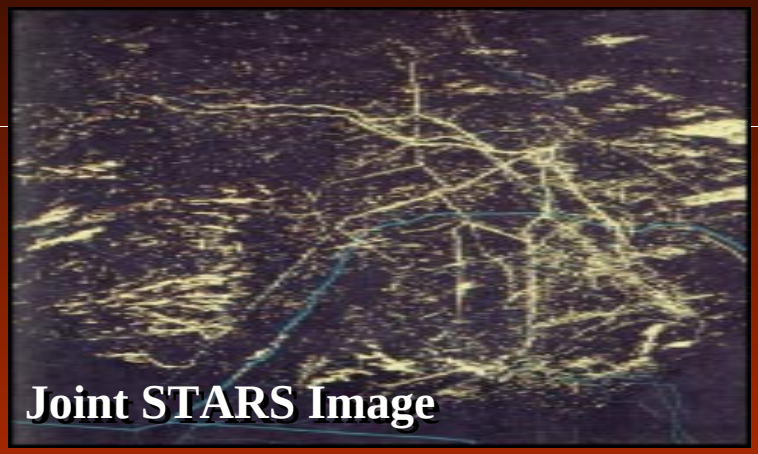


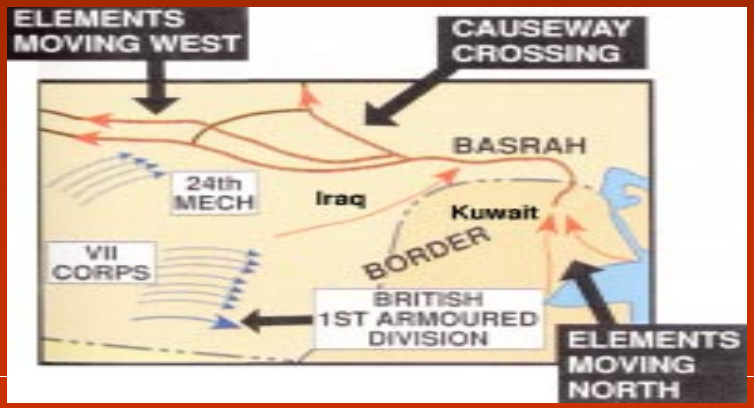
33% Net Obscuration
(12.5 min Flight Time)



- UGS Enhance Situational Awareness
- But…Clear Line-of-Sight Comms Needed

Blue/Coalition Force Monitoring





- **Friendly Situational Awareness**
- **Minimize Fratricide**

Technical Challenges

TTO
Tactical Technology Office

Antenna

Antenna

- Dual Polarity X-Band
- Nearly Omni-Directional
- Small w/ Isolation

Helical Antenna

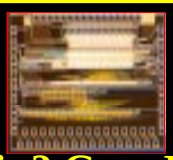
Up-Convert

A / D

Down-Convert

A / D

- 20 Gs/s @ 4 bits
- Low Power (<< 1 W)

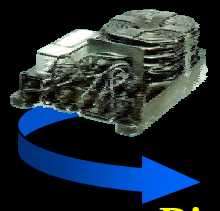


8-bit 2 Gsps D/A

Digital Delay and Modulator

- Required Versatility
- Low Power (< 1 W/GOP)
- Low Cost
- Small Size

Analog

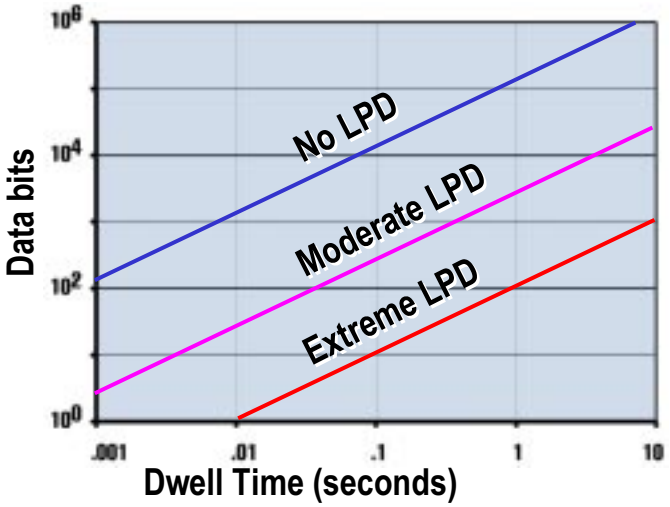


Digital

Technical Challenges

(Continued)

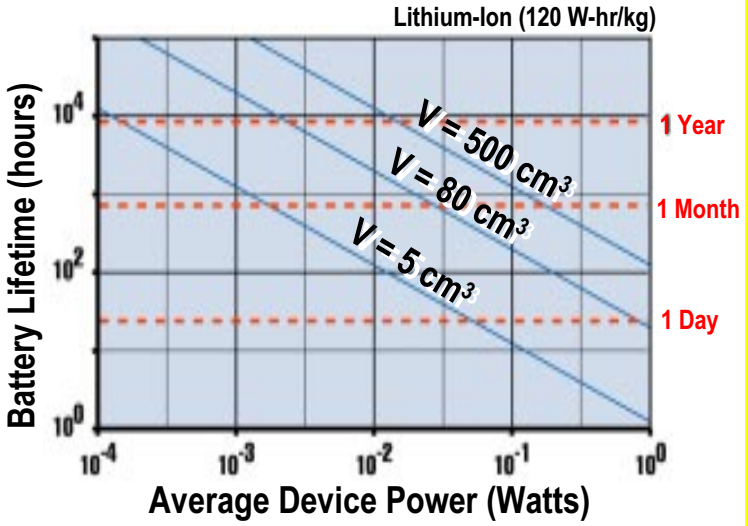
Theoretical Data Encoding Efficiency



Moderate: 2 km Intercept Range B = 50 MHz

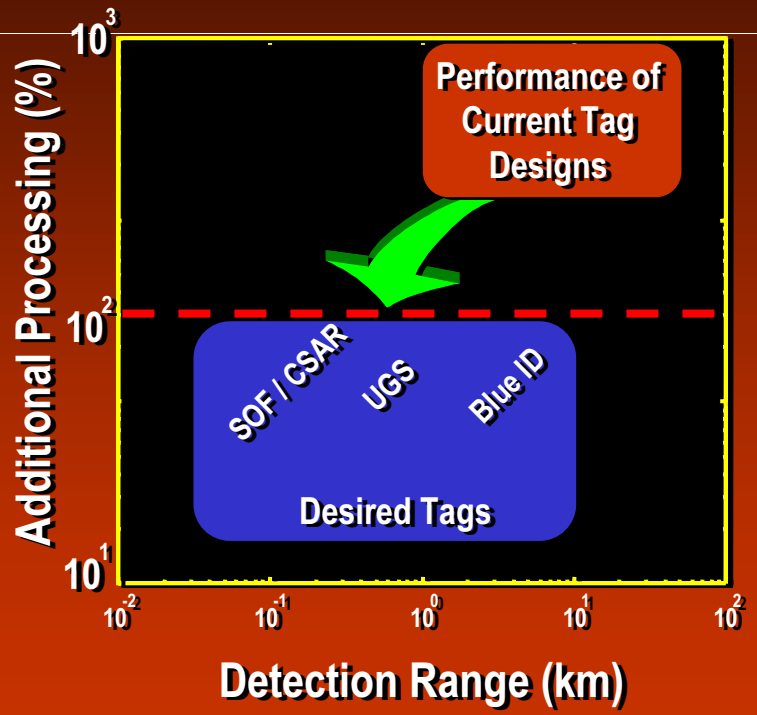
Extreme: 100 m Intercept Range f_p = 1000 pps

Lifetime

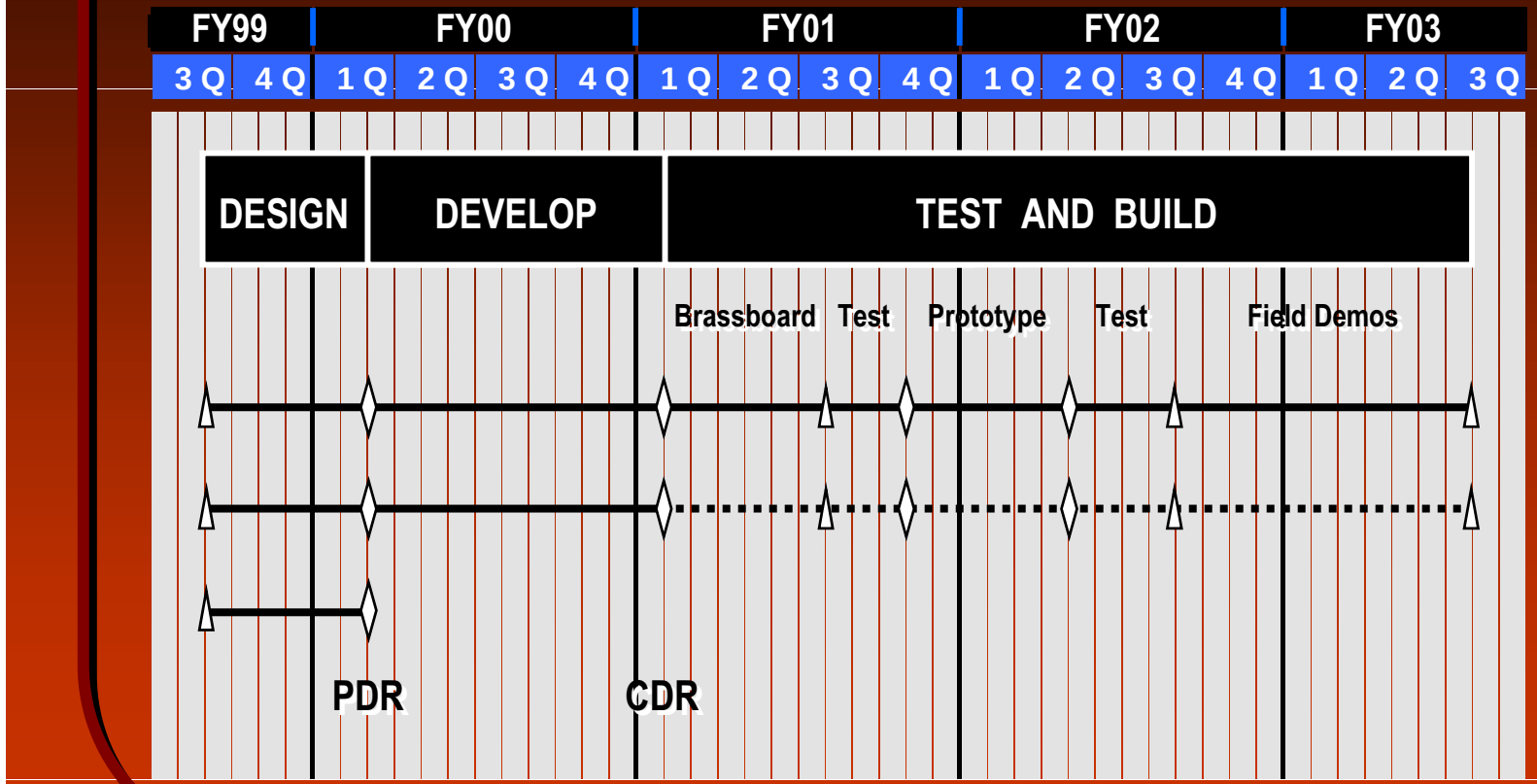


Additional Challenges

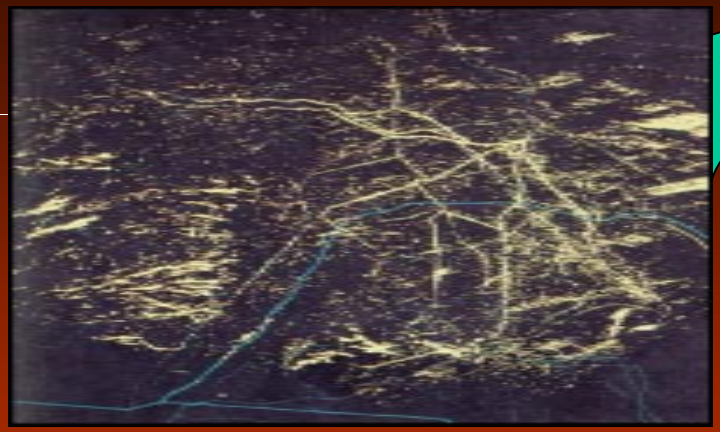
- Frequency Coverage (X-Band, VHF / UHF, Ku-Band)
- Decoding Processing Load
- Cost, Cost, Cost!

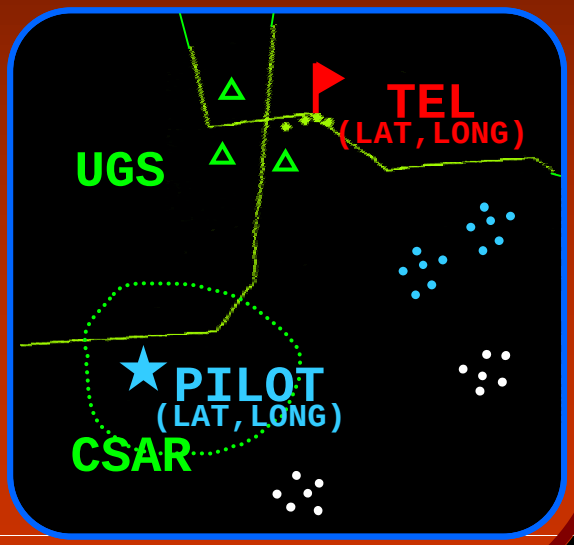


Program Schedule



Summary / Conclusions





Enhanced Understanding
of Blue and Red Forces