Human Native Form in applications SOF HUD:

"Enhanced Battlefield Awareness
Augmented Reality (AR)"

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Overview

- Problem Statement: Technology
- Human Native Form
- Antecedents of the Information Age
- Data vs. Information, or How the Brain Works
- HNF and the SOF HUD
- Innovation Model
- Prototype Development
- Way Forward

Problem Statement, or “Where I started…”

- Technological development in networked warfare is leaving ground forces behind
  - C4ISR is focused on Aircraft and Rear Echelons, ground forces play “telephone” with air support
- How do we give ground forces access to the networked war, without increasing their loadout, while decreasing their cognitive load?
- In what ways can improved heads-up display capabilities--using AR technology--decrease cognitive load on the battlefield, and improve efficiency and lethality?

Problem Statement Broadened, Refined, or "Where I ended up…"

- Because technology pervades every aspect of our existence
- and isolates humans from their environment
- How can we adapt technology to how humans best function?

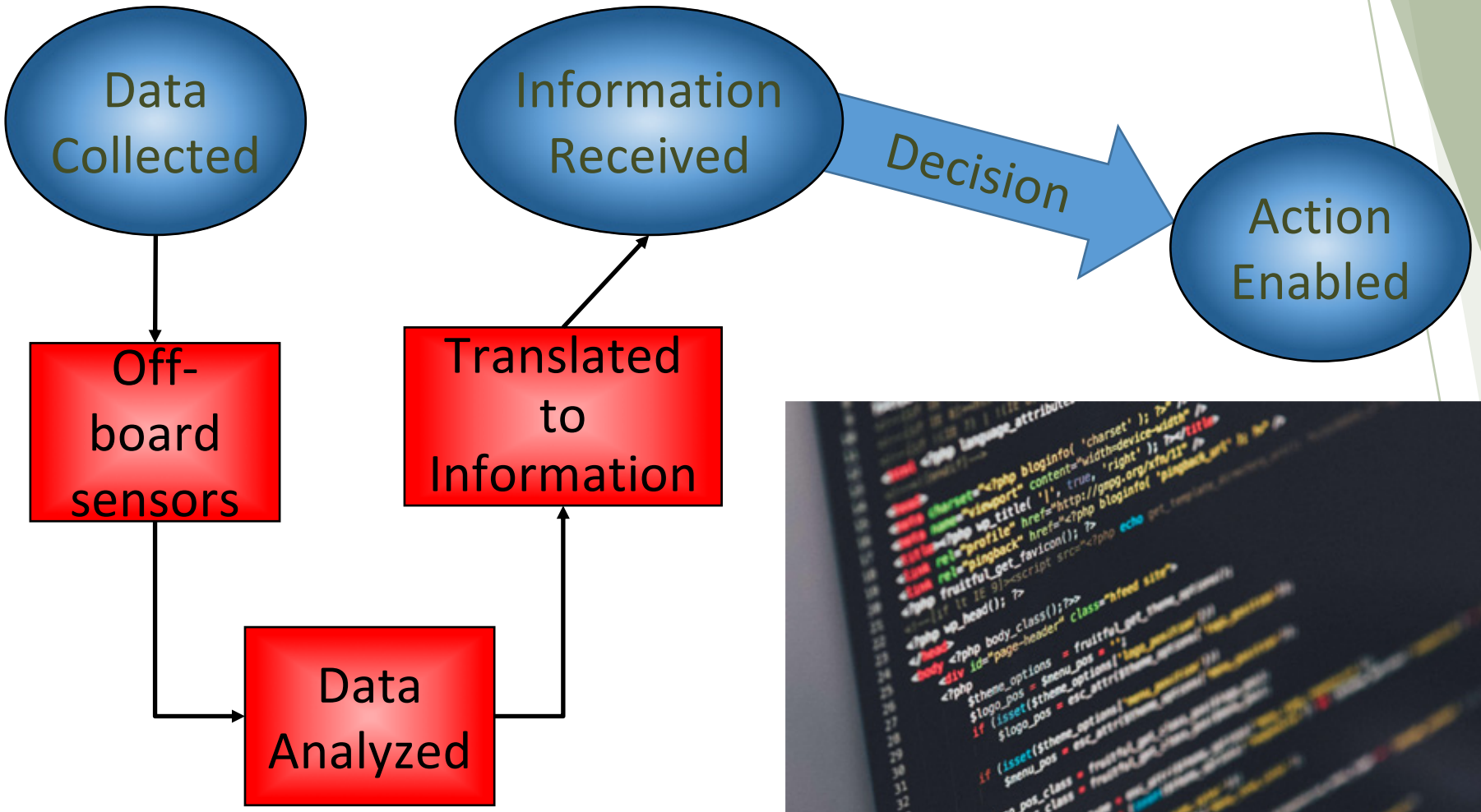
- A: By understanding how humans natively function and forming technology around this discovery

Human Native Form Defined

HNF theory posits that humans perceive the environment through senses and process the sense *natively,* producing useable information. This bypasses the need to translate data into information through cognition.

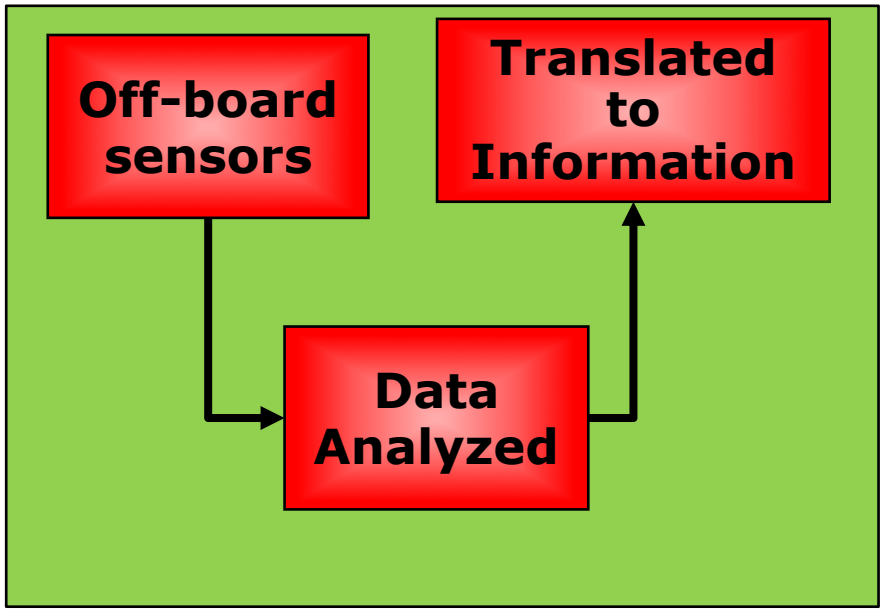
HNF presents information instead of data, which decreases cognitive load and increases available working memory while providing more information to the user; thus, allowing better informed decisions and faster more decisive actions.

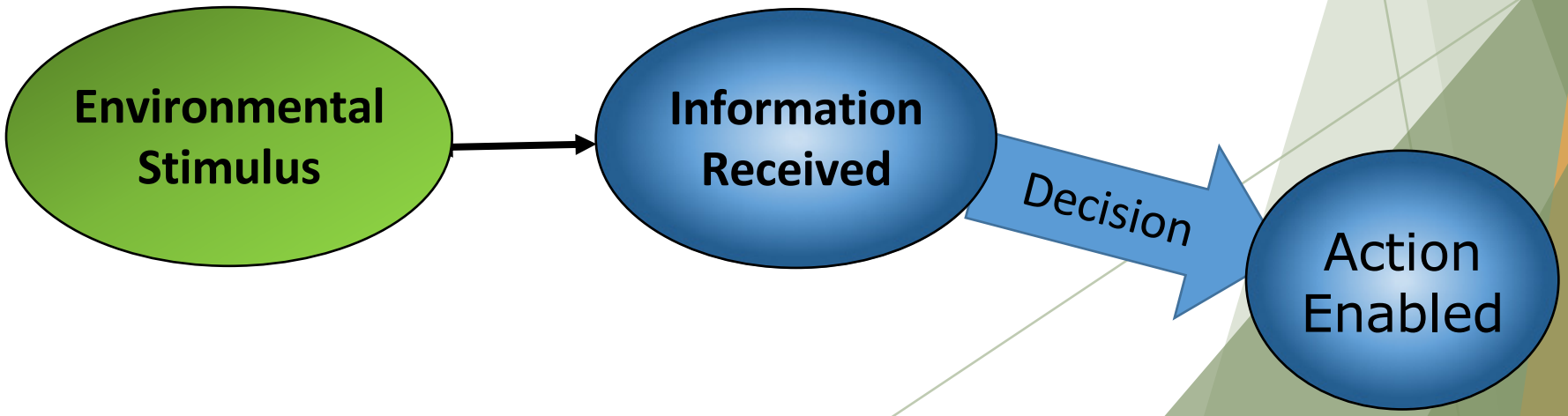
Data to Information



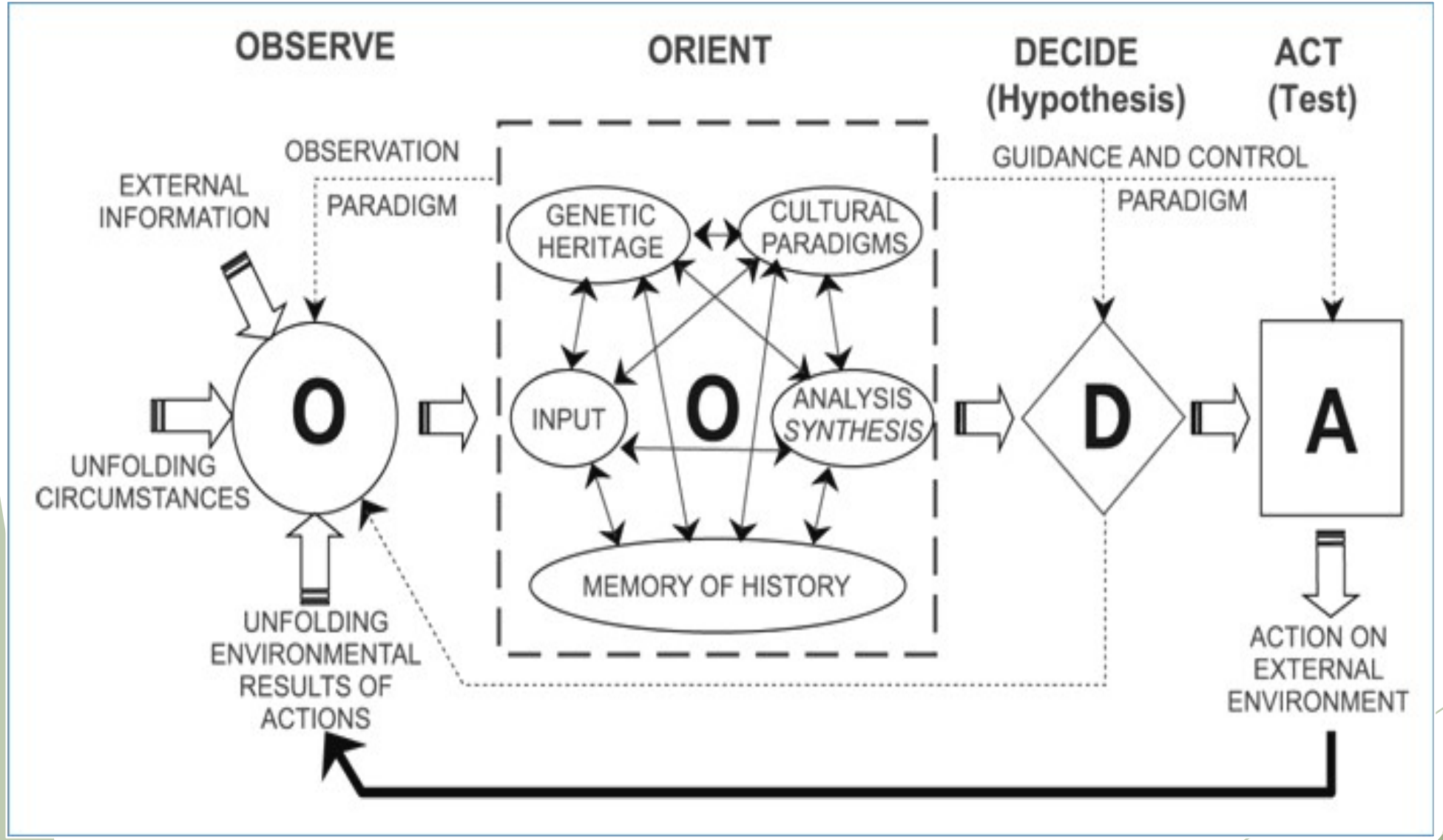
Information is derived from processed data, which informs decisions that enable actions

Information via HNF





Boyd's OODA Loop



Antecedents of the Information Age, or “I can’t believe he is going to bore me with history…

- Early technology:
  - Necessary
  - Solved problems on Human Scale
  - Elegantly and Simply
  - Focuses on how Humans interact with environment
  - Two approaches:
    1) Modify Environment
    2) Modify Ourselves

Modified Environment

Access and Movement

Subsistence and Sustenance

Civilization

Problem: Hostile Environment

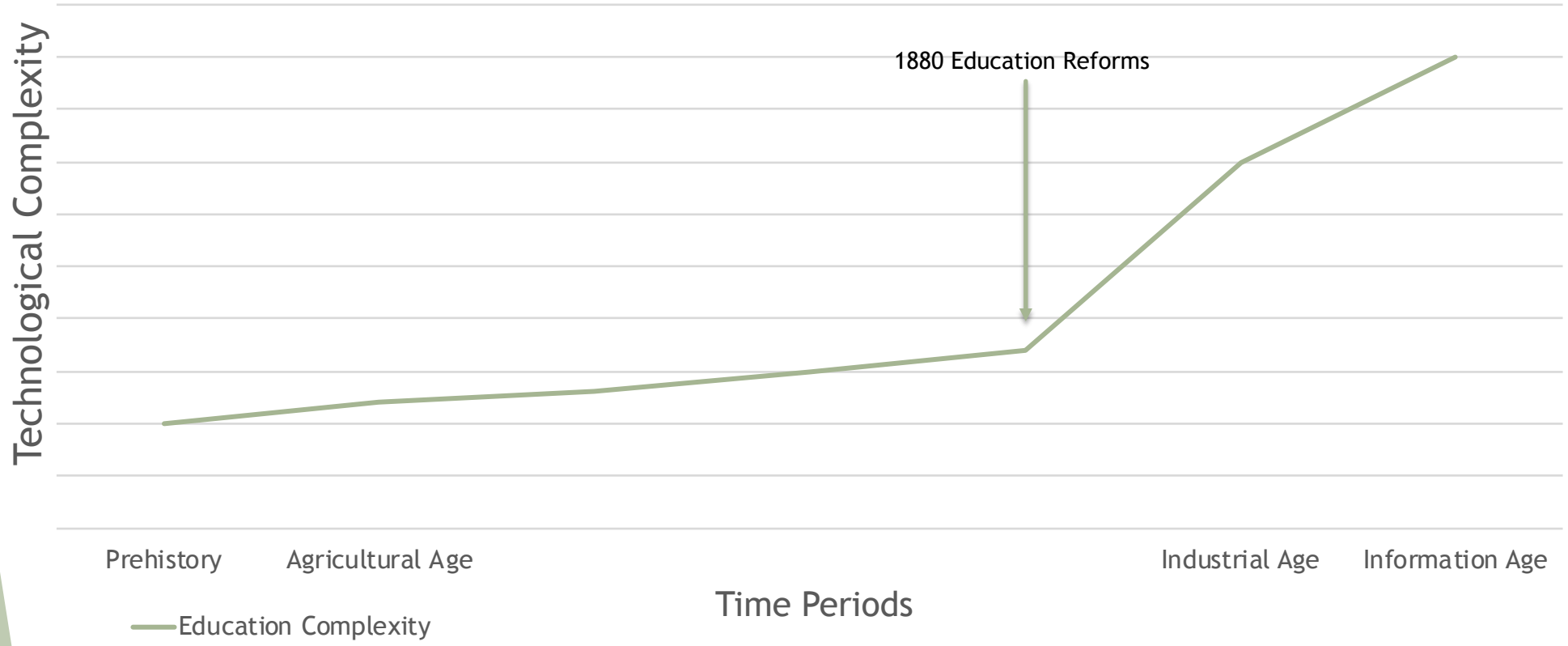
Modified (or Augmented) Humans

Antecedents of the Information Age, or “I can’t believe he is going to bore me with history…

- Industrial Age:
  - Changed the Basic Assumption…not scaled to humanity
    - Technology limits forced cultural adaptations from humans
    - Focused on production for consumption
  - Increasingly complex and specialized
- Case Study: Textiles

“Focus shifted from accommodating human actions to production for consumption”

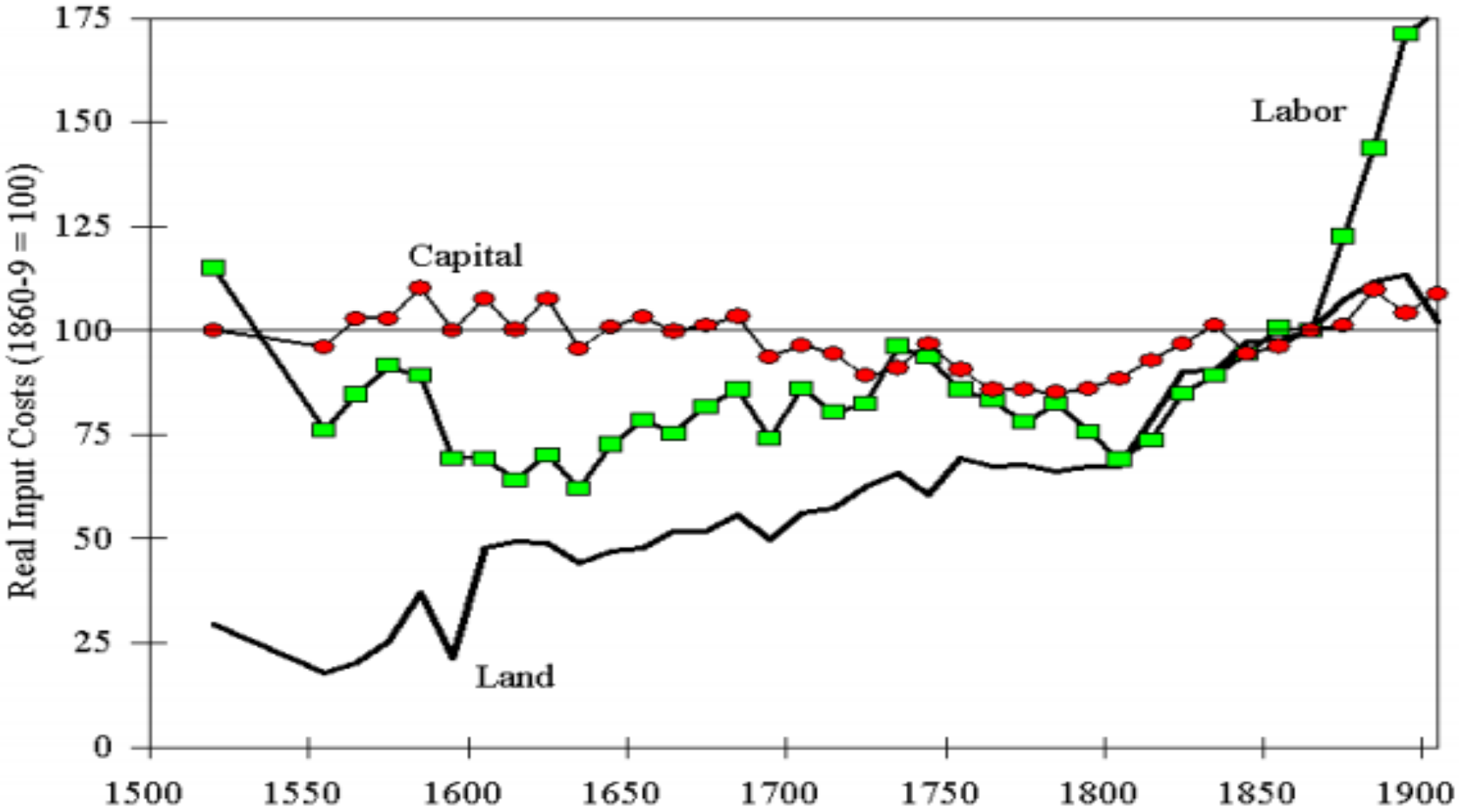
Technological Complexity shapes and drives Education



"A man educated at the expense of much labor and time to any of those employments which require extraordinary dexterity and skill, may be compared to an expensive machine. The work which he learns to perform, it must be expected over and above the usual wages of common labor, will replace to him the whole expense of his education, with at least the ordinary profits of an equally valuable capital."

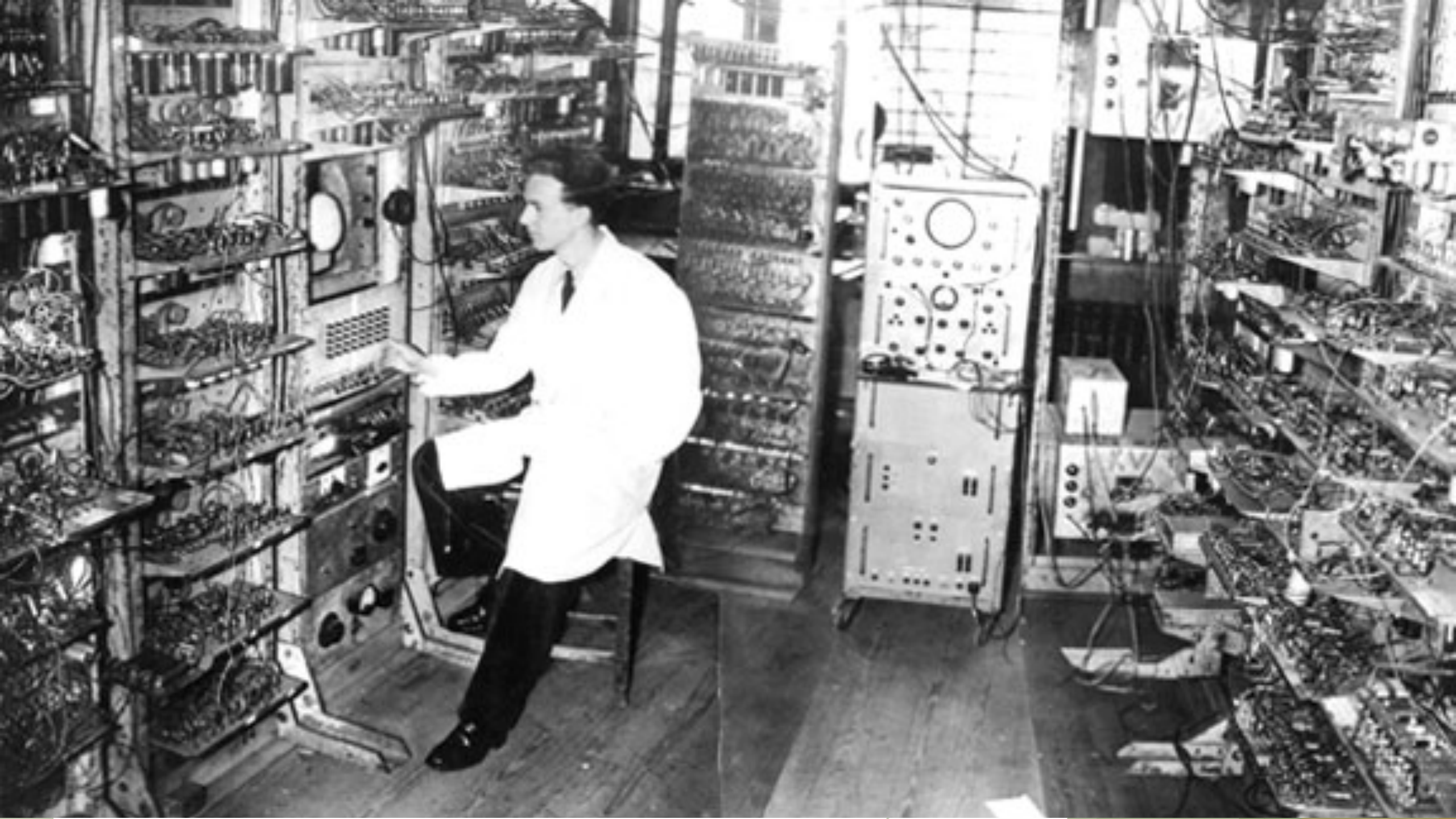
Adam Smith, *An Inquiry into the Nature and Causes of the Wealth of Nations*

Agricultural Output: 1500-1910



1830: 250-300 Labor Hours required to produce 100 Bushels

1930: 9.8 Labor Hours required to produce 100 Bushels



From the Industrial Age to Information Age

- Raw Materials:
  - Agricultural Age: Land and Labor
  - Industrial Age: Steel and Coal
  - Information Age: Data and Information
    - There is a problem with our lexicon here…they are not the same thing

"Focus shifted from accommodating human actions to production for consumption"

Data vs. Information

- Webster's Definition of Data:

  Factual information used as a basis for reasoning, discussion, or calculations.

- Information: knowledge obtained from investigation, study, or instruction.

Information is *consumable* as it is; data must be *translated* into information before consumption

Why Human Native Form (HNF), hint: the brain is not a computer…

- The American Way of War is information centric
- Data: too much of a good thing is too much
- Data and information are different
  - Data is descriptive
  - Information is usable
- Old cognitive models incorrectly compare the human brain with a computer, but reality is more complex

Turning data into information is cognitively intensive

Thesis:

Augmented reality bridges the network gap by integrating air support with ground forces through an intuitive display, providing warfighters more accurate information while decreasing cognitive load.

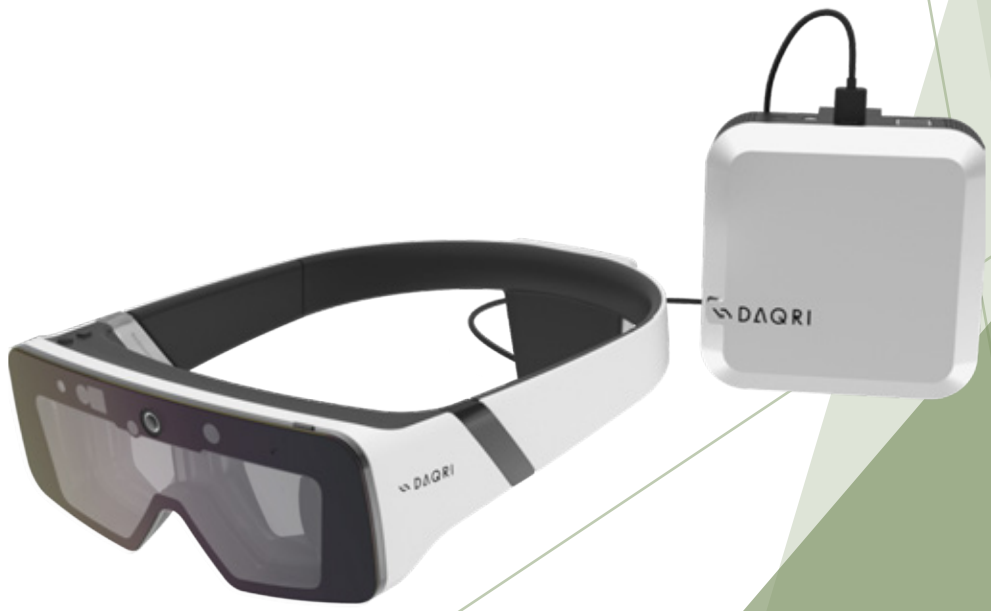
This enables faster decisions, and more decisive action when most needed.

What is the SOF HUD?

A device that decreases extraneous cognitive load by presenting information visually in an intuitive way.

It is device agnostic, and should take advantage of commercial off the shelf (COTS) technology and evolve with technological advancements.

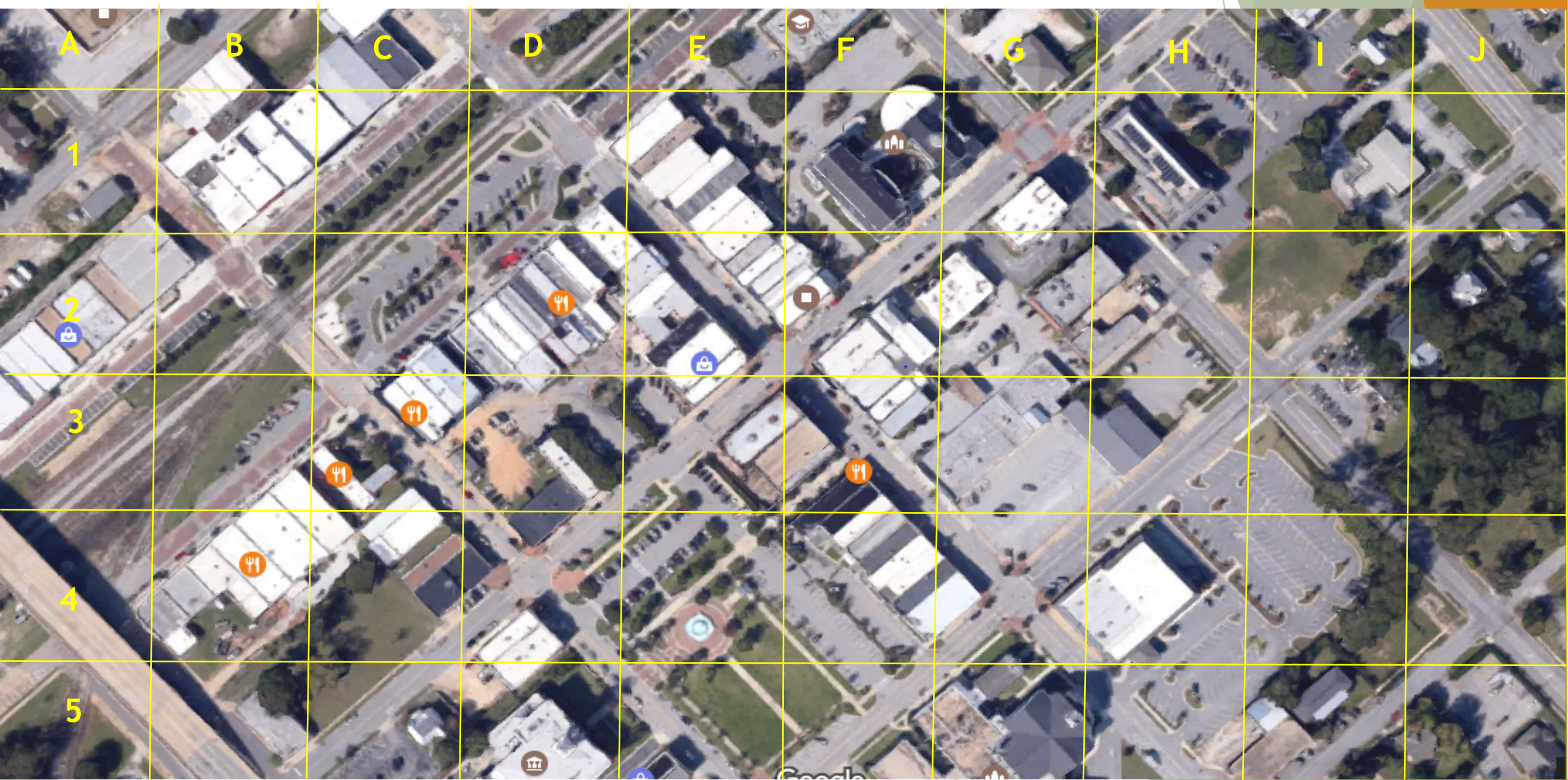
It must communicate across different systems in the current military inventory.



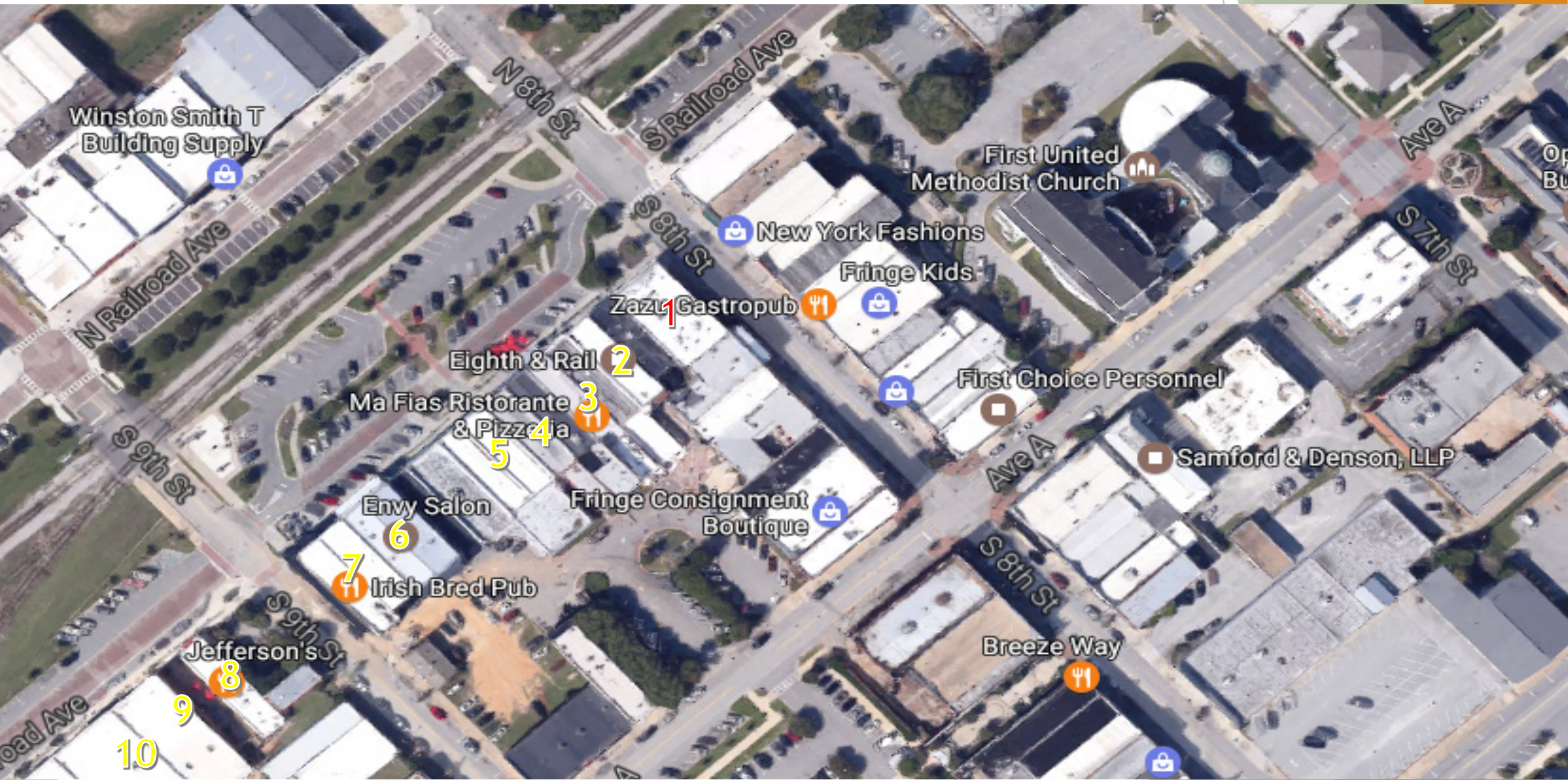
Exercise

Use the following Gridded Reference Graphic (GRG) and Graphic Overlay Symbols (GOS) to identify the target area.

GRG



GOS


Winston Smith T Building Supply
N 8th St
S Railroad Ave
First United Methodist Church
Ave A
N Railroad Ave
S 8th St
New York Fashions
S 7th St
Fringe Kids
Zazu Gastropub
1
Eighth & Rail
2
First Choice Personnel
Ma Fias Ristorante & Pizzeria
3
4
5
S 9th St
Ave A
Samford & Denson, LLP
Envy Salon
6
Fringe Consignment Boutique
7
Irish Bred Pub
S 8th St
S 9th St
Jefferson's
8
Breeze Way
9
10

Exercise
Locate your present position and target building (#1)

Exercise

Now use the augmented reality SOF HUD to identify the

- TGT Building (red arrow and number 1)
- Your position on the GRG (yellow grid with ID)
- AC-130’s Sensor sight lines (arrows)
- AC-130’s position and orbit (icon and orbit outline)
- Friendly Troop (Blue Arrow)

FL 10: AC-130
1
2
3
4
D2
Google

The “So What”

With simple augmented reality overlays, vast amounts of information and situational awareness can be intuitively processed without cognitive overload.

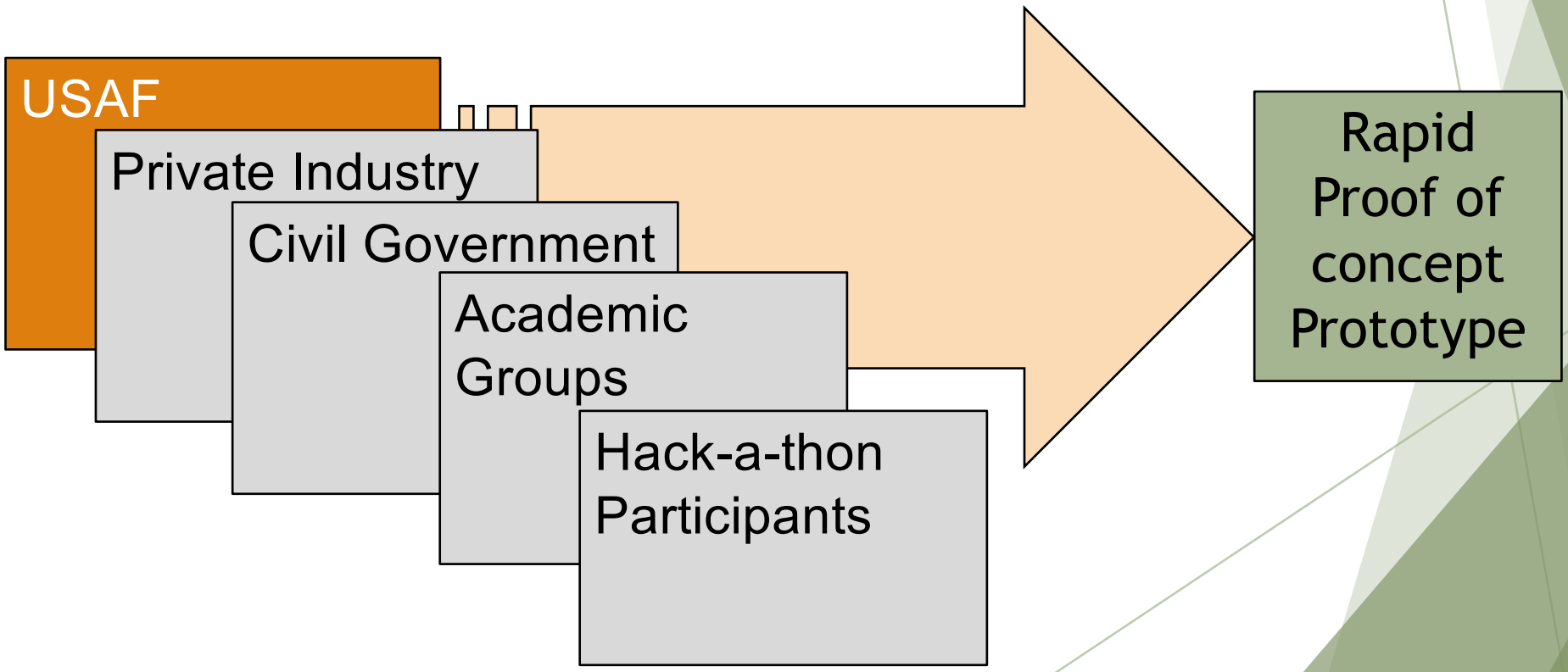
More information is processed, enhancing battlespace awareness. This eliminates much of the radio communication, speeding up decision making and increases mission efficacy.

Why spend so much effort on a 5th Generation Air Force if we are not making a 5th Generation Ground Force?

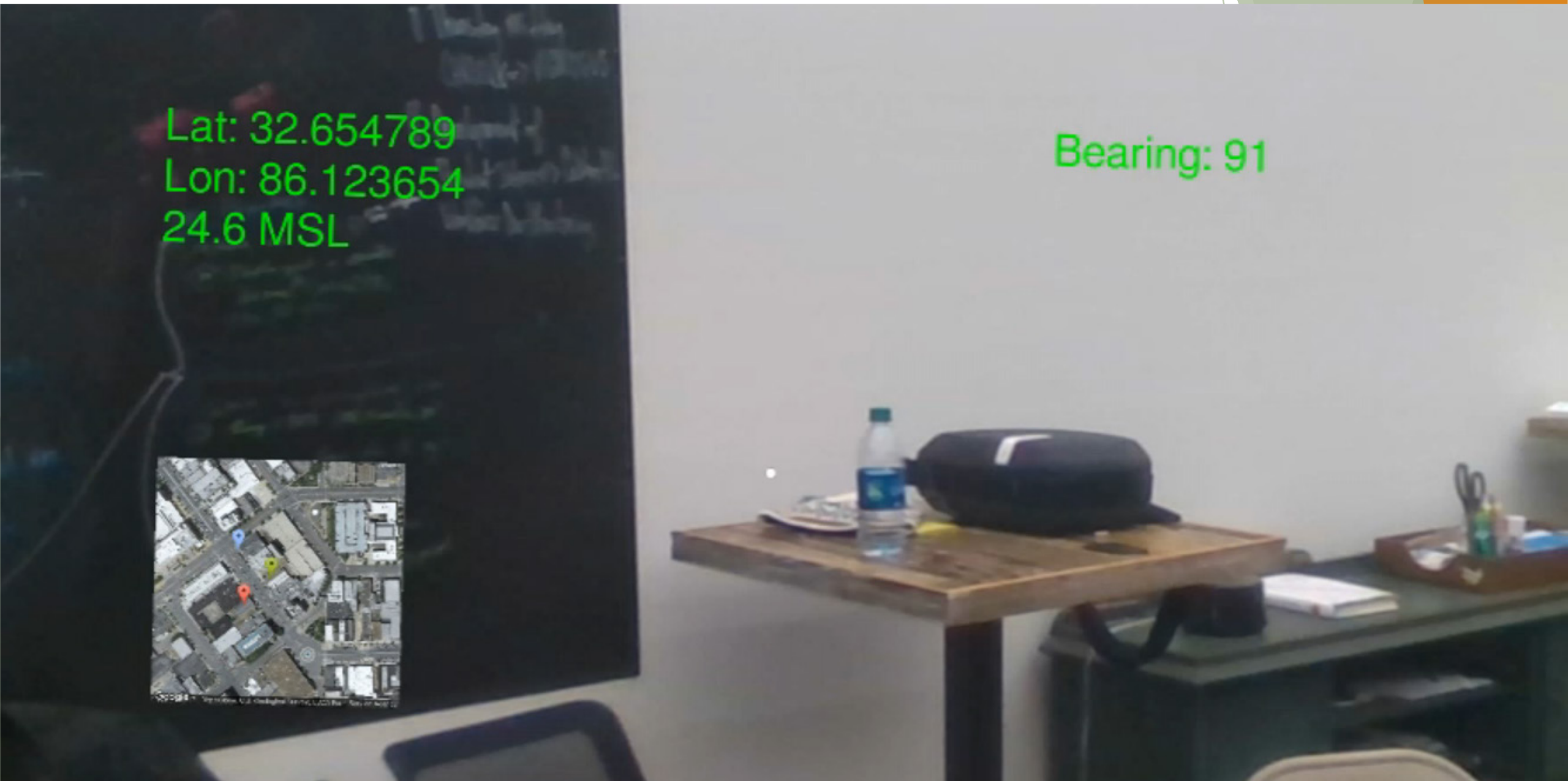
Can our IT/C4ISR structure to support all of this? If not what needs to be done?

Innovation Models

- Problem: How to make a new technology when you don't know how to program?
- Answer: Build a capable team and recruit talent, or hold a Hack-a-thon.



SOF HUD Prototype



Way Forward

- SOF Air-Ground Integration, every platform and every ground troop a sensor
  - Enhanced SA for Air and Ground: present info better
    - Red force tagging, Blue Force Tracking, Digital nine-lines
    - SPI, Courser on Target, etc.
    - RED and BLUE Force tracking, C4ISR integration from JOC to battlefield
  - Cut voice communications, eliminate ambiguity and error
    - Instant data sharing
  - **Flatten communication, shorten decision tree, speed up kill chain**

Way Forward

- Future use:
  - Tie in with local AI enhanced Network
    - Assist with C2, medical triage, biometric tracking, SNAP reports, SITREPs, 3D mapping of tgt area, enemy and non-combatant tracking (with UAS), UAS Swarm integration
    - The possibilities are endless, vision is all that is needed

Parting Shot

Far too long we have adapted our lives to technology; the next technological revolution will adapt technology to our lives. Presenting data in AR represents an initial step in that revolution.