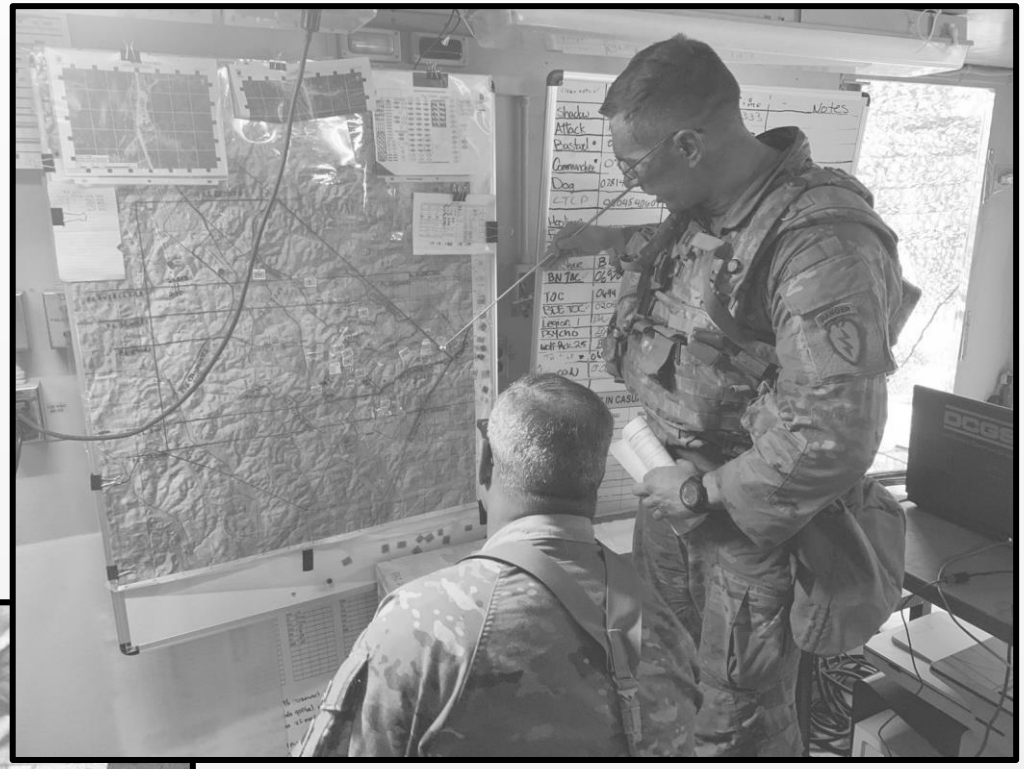
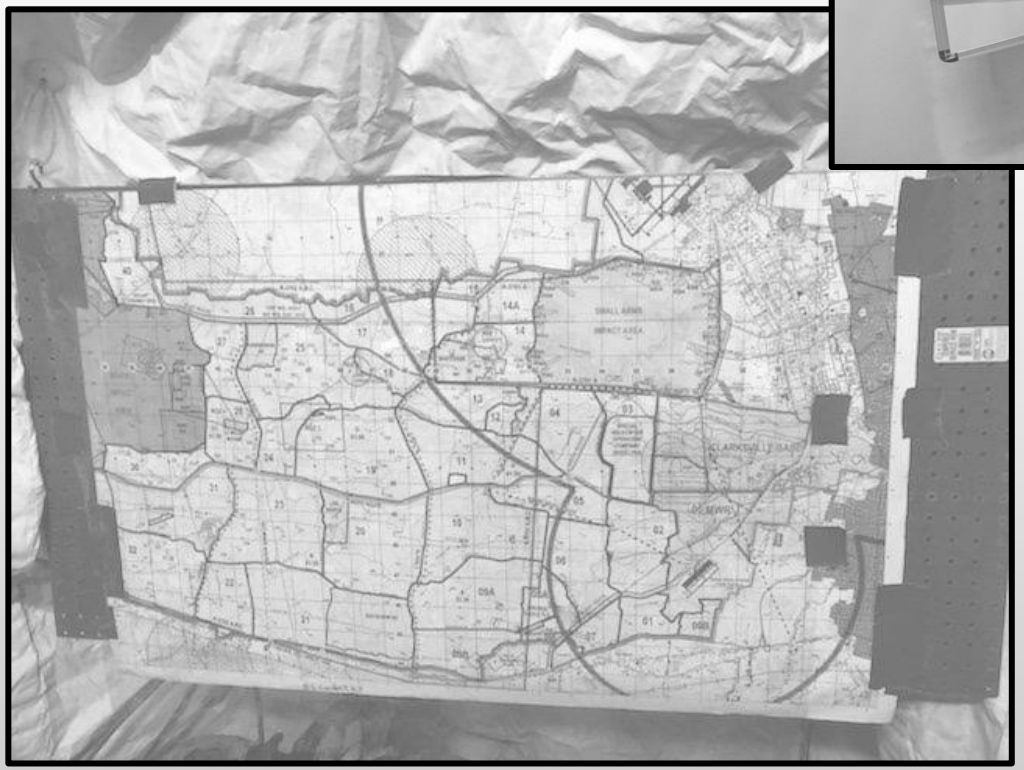
Déjà Vu: Maintaining Situational Understanding Through an Analog Common Operational Picture.



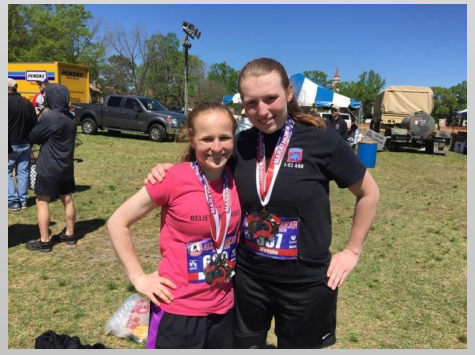


Maggie Troxell

Penn State MGIS Student

About Me

- Undergraduate degrees in French and Psychology from King's College, Wilkes-Barre, PA
- Intelligence Officer in the Army for 7 years
- 2x Combat Deployments
- 3x Rotations at the Joint Rotational Training Center
- Countless field exercises and Warfighter Exercises
- Pursuing my MGIS with GEOINT Option from Penn State University

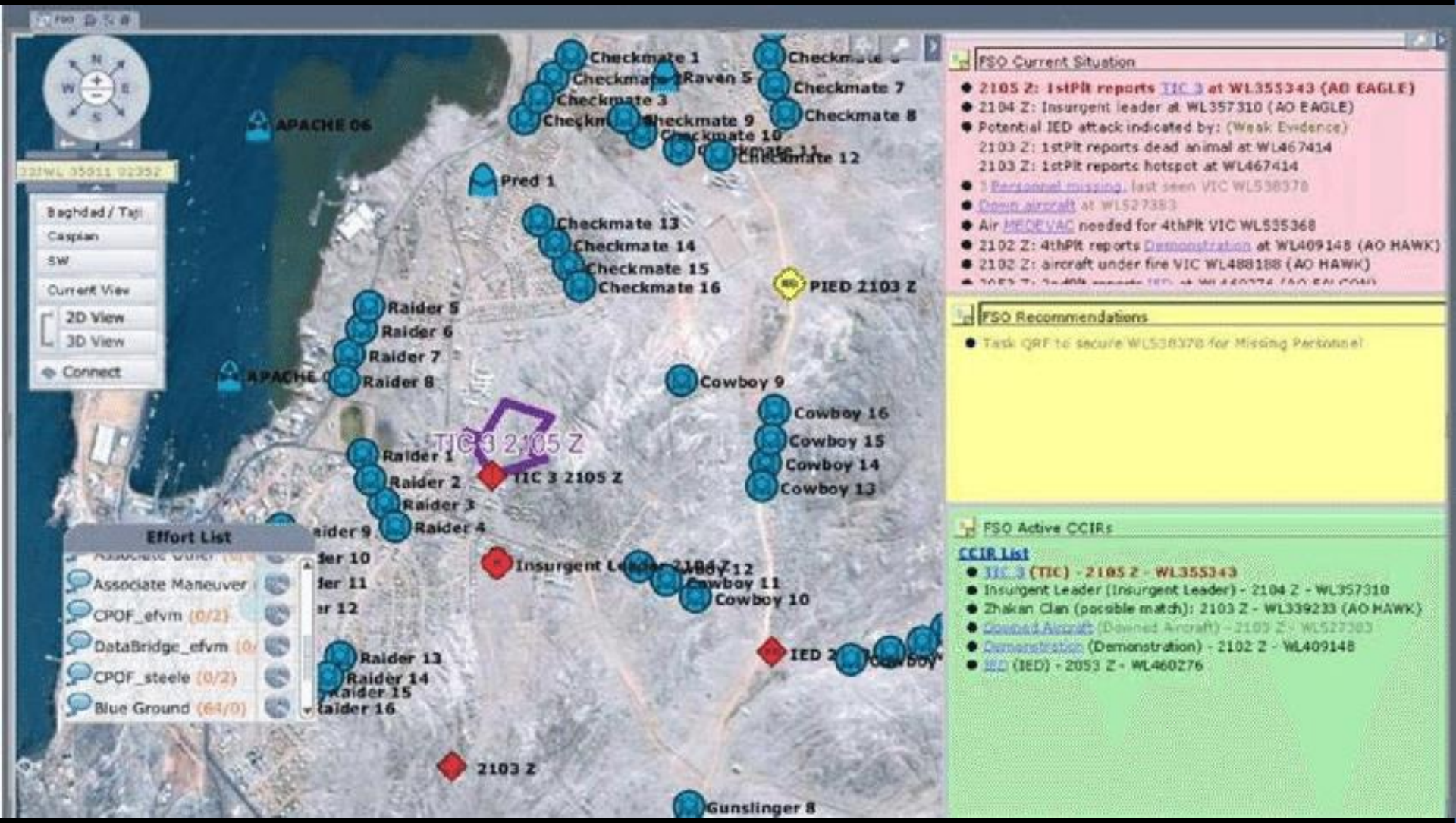


What is a MCP or “Main Command Post”

“A *main command post* is a facility containing the majority of the staff designed to control **current operations**, conduct **detailed analysis**, and plan **future operations** (FM 6-0). The main CP is the unit’s principal CP serving as the primary location for plans, analysis, sustainment coordination, and assessment.” – Army Techniques Publication 6-0.5, para 1-20

What is a COP

"The *Common Operational Picture* is a display of **relevant information** within a commander's area of interest **tailored to the user's requirements** and based on common data and information shared by more than one command." - Army Doctrine Publication 6-0, para. 3-54


FSO Current Situation
2105 Z: 1stPlt reports TIC 3 at WL355343 (AO EAGLE)
2104 Z: Insurgent leader at WL357310 (AO EAGLE)
Potential IED attack indicated by: (Weak Evidence)
2103 Z: 1stPlt reports dead animal at WL467414
2103 Z: 1stPlt reports hotspot at WL467414
Personnel missing, last seen VIC WL538378
Down aircraft at WL527383
Air MEDEVAC needed for 4thPlt VIC WL535368
2102 Z: 4thPlt reports Demonstration at WL409148 (AO HAWK)
2102 Z: aircraft under fire VIC WL488188 (AO HAWK)
FSO Recommendations
Task QRF to secure WL538378 for Missing Personnel
FSO Active CCIRs
CCIR List
TIC 3 (TIC) - 2105 Z - WL355343
Insurgent Leader (Insurgent Leader) - 2104 Z - WL357310
Zhakin Clan (possible match): 2103 Z - WL339233 (AO HAWK)
Downed Aircraft (Downed Aircraft) - 2103 Z - WL527383
Demonstration (Demonstration) - 2102 Z - WL409148
IED (IED) - 2053 Z - WL460276
Baghdad / Taji
Caspian
SW
Current View
2D View
3D View
Connect
Effort List
Associate Maneuver
CPOF_efvm (0/2)
DataBridge_efvm
CPOF_steele (0/2)
Blue Ground (64/0)
Checkmate 1
Raven 5
Checkmate 7
Checkmate 8
Checkmate 3
Checkmate 9
Checkmate 10
Checkmate 12
Pred 1
Checkmate 13
Checkmate 14
Checkmate 15
Checkmate 16
PIED 2103 Z
APACHE 06
Raider 5
Raider 6
Raider 7
Raider 8
Cowboy 9
Cowboy 16
Cowboy 15
Cowboy 14
Cowboy 13
TIC 3 2105 Z
Raider 1
Raider 2
Raider 3
Raider 4
Insurgent Leader 2104 Z
Cowboy 12
Cowboy 11
Cowboy 10
IED 2
Raider 13
Raider 14
Raider 15
Raider 16
2103 Z
Gunslinger 8

Agenda

- Relevance/Background
- Digital Vs. Analog COPs
- Designing the Analog COP
- Human-Centered Design and Design Thinking
- Project Timeline
- Questions/Comments

Relevance/Background

Over-reliance on computerization yields deeper susceptibility to hostile disruption and automation.

Poor environmental conditions (rain, storm, space weather interference with network connectivity and SATCOM)

Lack of or sabotaged logistical requirements (fuel for generators to maintain power, no local infrastructure to rely on, etc.)

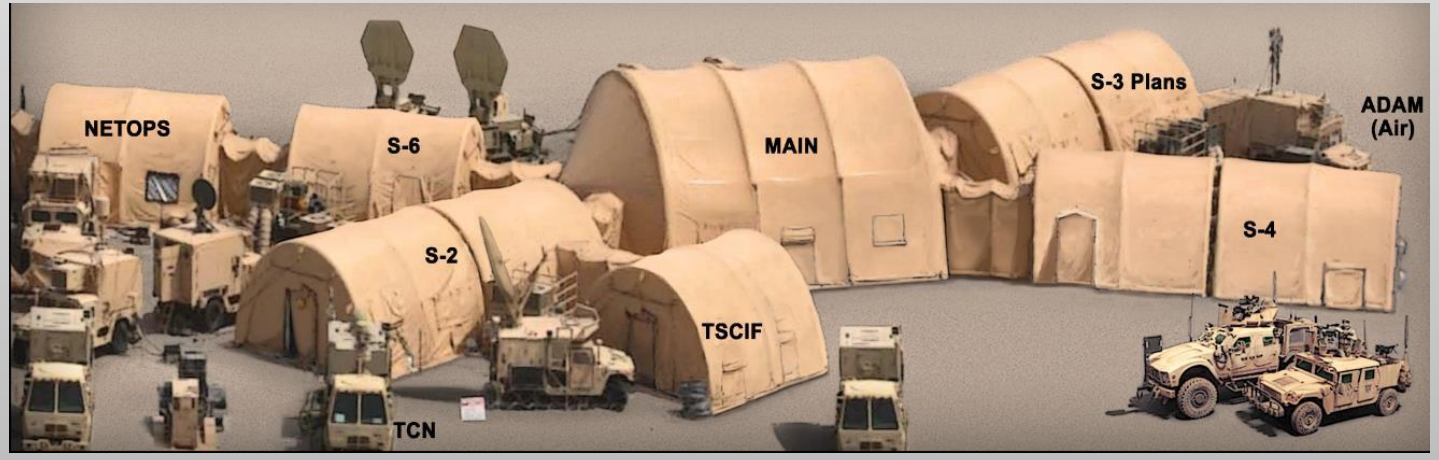
Digital systems can be cumbersome, complicated, and unreliable (lack of network establishment knowledge)

Over-reliance on computerization yields deeper susceptibility to hostile disruption and automation.

- The 2018 National Defense Strategy turns the military focus towards “Inter-State strategic competition.”
- U.S. Army Training Circular 7-100 *“The Hybrid Threat”* which represents, in a general way, the future threats the U.S may face as well as compiles capabilities of actual threat forces. Among them are:
  - Electronic warfare (EW).
  - Deception.
  - Physical destruction.
  - Protection and security measures.
  - Perception management.
  - Information attack (IA).
  - Computer warfare.
- These capabilities are also highlighted in Daniel Pinkston’s “Inter-Korean Rivalry in the Cyber Domain: The North Korean Cyber Threat in the "Sŏn'gun" Era”

Lack of or sabotaged logistical requirements (fuel for generators to maintain power, no local infrastructure to rely on, etc.)

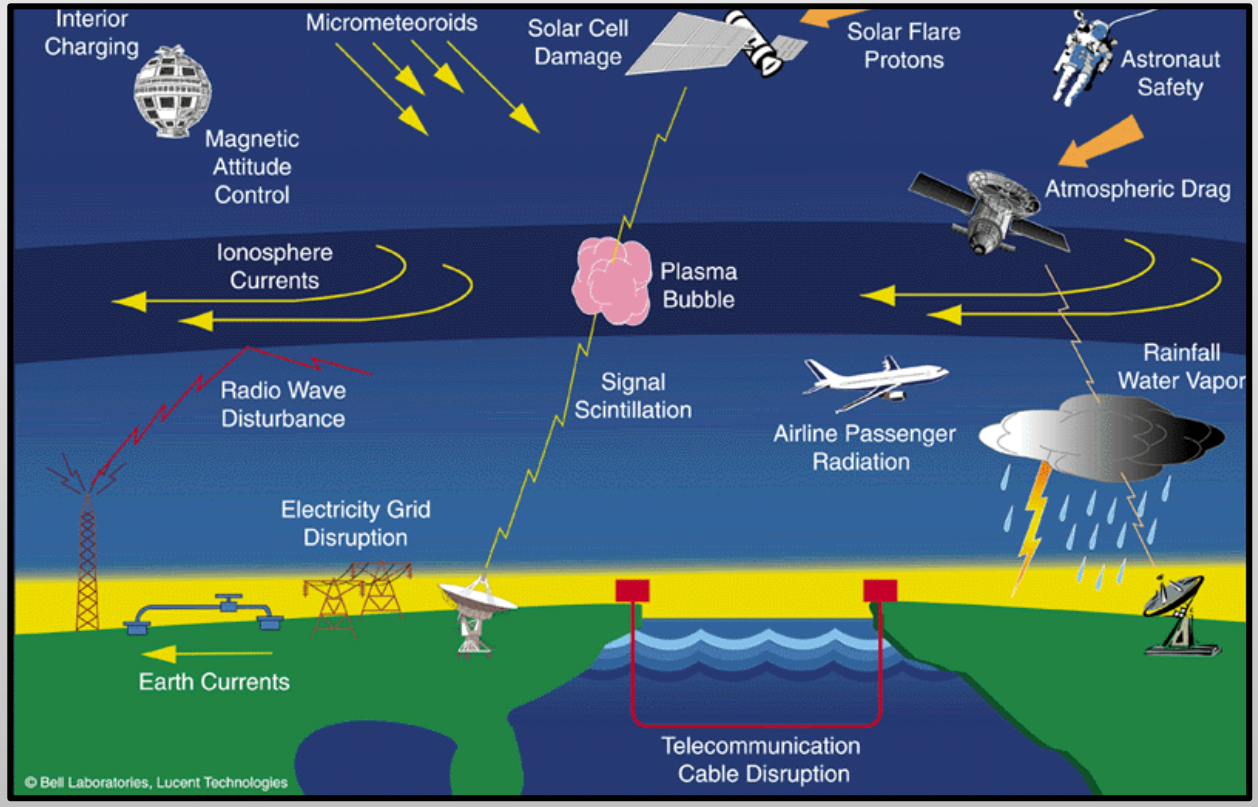
- 15k Generator has an 8.6 gallon tank for JP-8 with a 0.77 gallons/hour burn rate.
- 30k Generator has a 23 gallon tank for JP-8 with a 2.6 gallons/hour burn rate.
- Up to 14x generators to run a Brigade level CP. – Lombardo and Selby. *Iron Brigade's Combat-Team Pursuit of Mobile Command-Post Capabilities.* Lessons-Learned About Command Posts. 2017.



Poor environmental conditions (rain, storm, space weather interference with network connectivity and SATCOM)

Space weather such as solar flares or magnetic storms can cause significant disruption in Satellite Communications by adding several Gigawatts of electricity to the atmosphere.

Terrestrial weather such as rainfall and thunder storms can also degrade Satellite Communications due to interference with the Satellite's link.



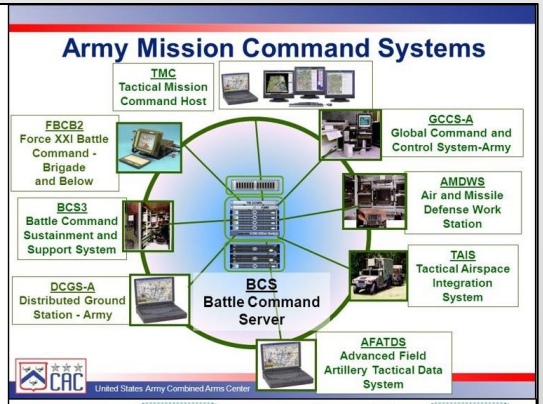
Space Weather Introduction. *Multiverse by UC Berkeley*. 2020.

Digital systems can be cumbersome, complicated, and unreliable (lack of network establishment knowledge)

- Mission Command Systems are typically transported using several large tough boxes.
- Several systems are used to create one COP as each system provides a different layer.
- The Brigade or Battalion relies upon one Staff section known as “the S6” to establish the network and connect all relevant systems to the network and each other which is very time consuming and complex.

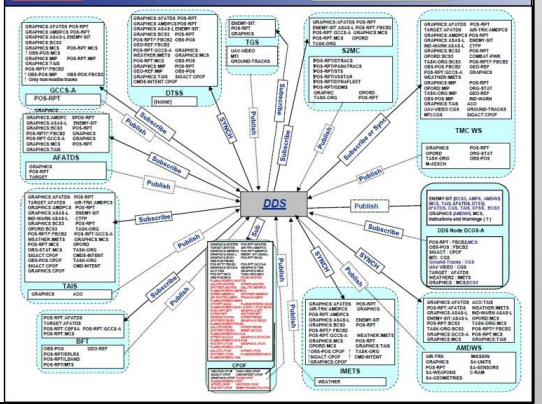
Portrayal of MCIS

- Each system owns an integrated layer of the COP
- All systems are feeding a central server or service on the BCCS
- Being a part of MCIS ensures each system can talk to each other
- Seamless communication across WfFs
- Integrated & open view of data for situational understanding & targeting



MCIS Realities

- Each system owns a disparate layer of the COP
- All systems feed the DDS to feed the TMC
- Systems can only communicate between each other via the DDS
- Fractured & limited communication across WfFs
- Reliant on specific message formats to communicate specific & limited data



Portrayal v. Realities of MCIS. Hopp, G. Modern War Institute. (2019)

The Army's focus on digital systems…

"A **nine-Soldier infantry squad** is dependent on up to **150 satellites** from five different satellite constellations, and a standard Army Infantry Brigade Combat Team has over **2,500 Program of Record items of space-enabled equipment** on its Modification Table of Organization and Equipment (MTOE)." – Coffey, et. al. *Tactical Staff Considerations for Winning In a Denied, Degraded, and Disrupted Space Operational Environment.* News From the CTC. 01 February, 2019.

… and the detrimental effect on analog systems.

- No design standardization, examples, or recommendations on analog COPs in doctrine.
- No assigned equipment on the Modified Table of Equipment associated with an analog COP.
- Examples come from Lessons Learned publications.

How We Know We Need to Do Better

- Since 2016, military Combat Training Centers simulate an austere environment similar to what can be expected in an Inter-State power competition sometimes referred to as “great power competition (GPC)”.
- Although digital systems are tested, the scenario calls for all digital systems to fail, forcing the units to continue the battle on analog systems.
- Several Lessons Learned publications indicate that units quickly lose situational awareness when forced to shift to analog systems, especially the analog Common Operational Picture (COP)

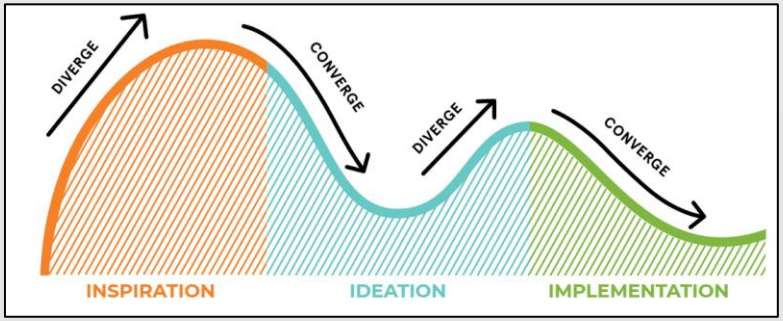
Developing A Design For The Analog COP

- Much like a digital GIS, the COP “is a **framework** for gathering, managing, and analyzing data. Rooted in the **science of geography**, GIS **integrates** many types of data. It analyzes **spatial location** and **organizes layers** of information into visualizations using **maps** and 3D scenes.” Esri. 2020. “What is GIS?” *Esri Website.*
- Commercial companies have attempted designs but fail.

Standard Command Board. *Command Concepts.* 2018.

Battle Board Swift 4.0. *Battle Board.* 2020.

Design Methodology: Human-Centered Design + Design Thinking



Human-Centered Design Process. *IDEO.org.* 2020.

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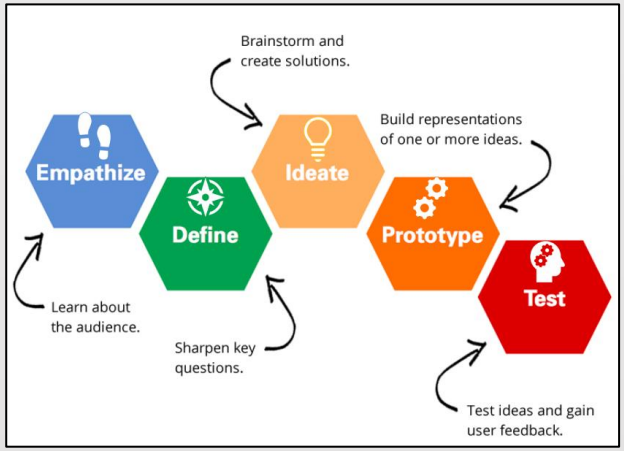

Design thinking process. *Stanford's d.school.* 2020.

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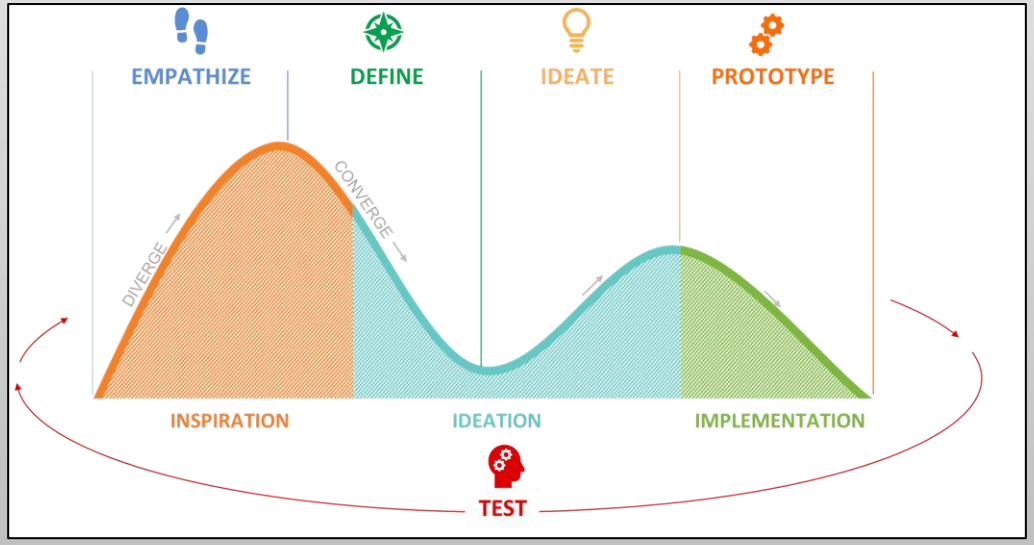
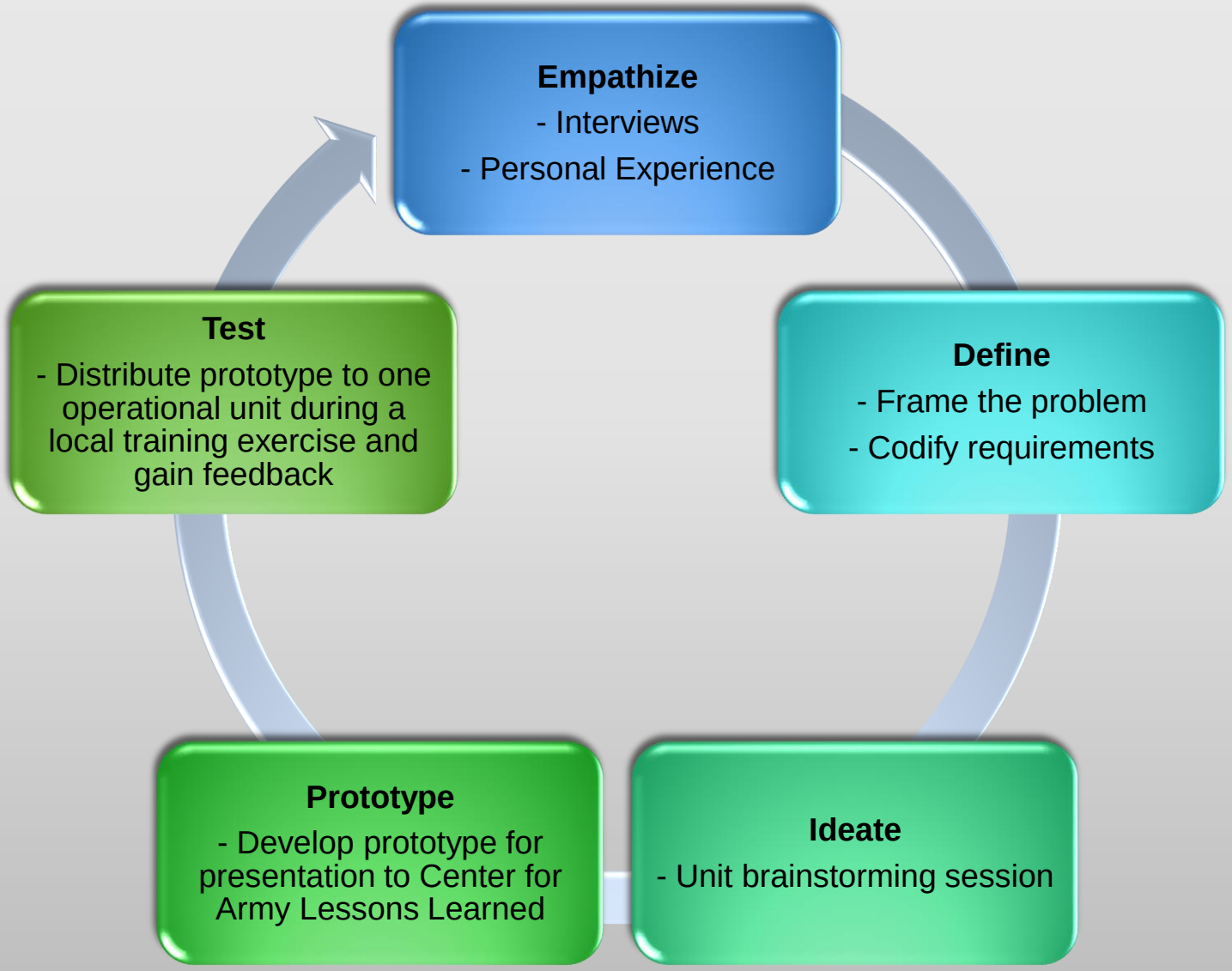
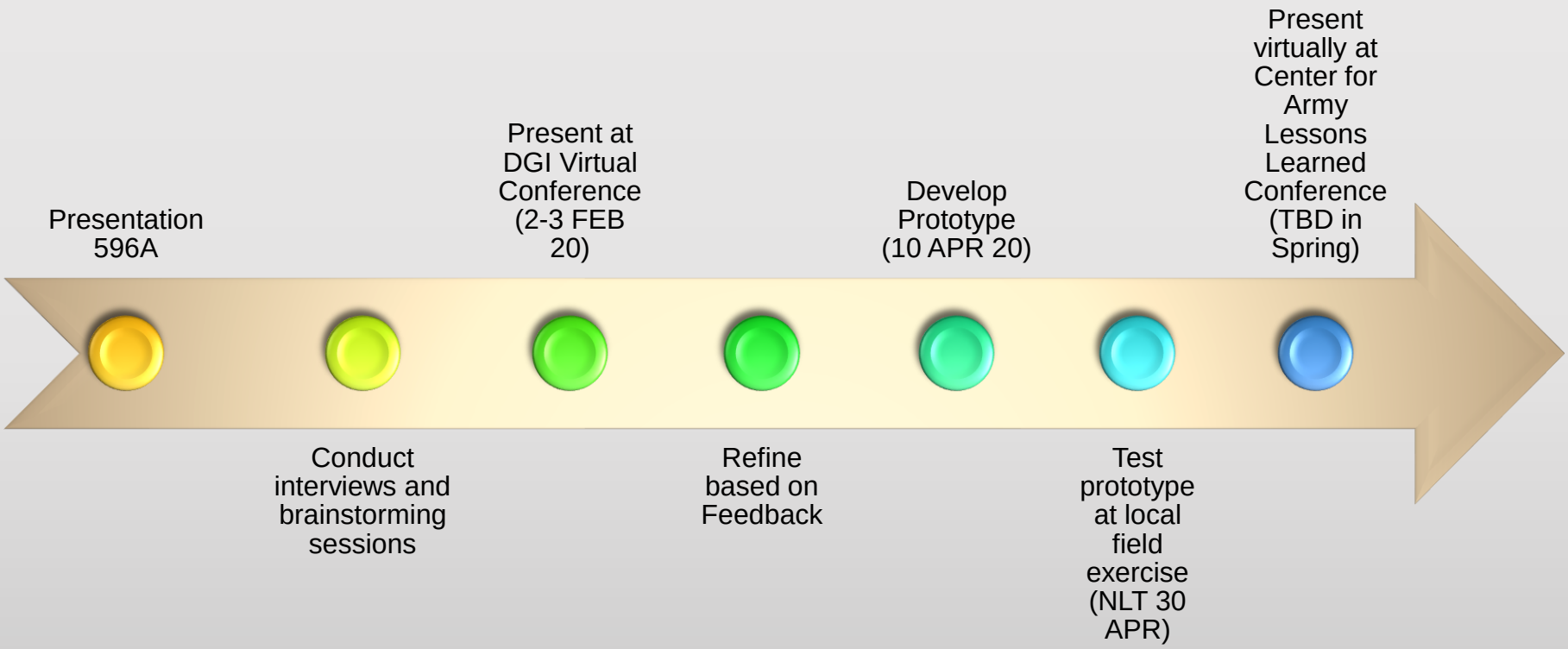


Using Human-Centered Design with Design Thinking. Hoover, C. Moving World Institute. 2018

HCD + DT Process



Project Timeline



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Questions/Comments