The Changing Character of Warfare:

Combined Arms Defense Dominates

Dr. T. X. Hammes
Institute for National Strategic Studies
National Defense University

The Key Rule of Military History

Leave Mountain People Alone

Purpose

- What drives changes in character of warfare?
- What is driving change today?
- What impact will these changes have on the various domains of warfare?
- Operational and strategic implications
- Some questions to consider

Underlying
NATURE OF WAR
does not change,

CHARACTER OF WARFARE
changes continually

Key Question -

Why does the character of war evolve?

Character of Warfare Reflects Societies

- Economic
- Political
- Social
- Technical

Technical is least important

Warfare is evolving

- Widespread agreement
- What it will be – continuing disagreement
- Three types of enemy
  - State, Insurgent, Terrorist
  - Crime is always present

Emergent Capabilities

- Pervasive Surveillance
- Precise mass
  - Drones/rockets/missiles with Task Specific AI
  - Advanced (3D) manufacturing
- C4ISR that can exploit both to create combined arms

Pervasive Surveillance:

All weather, all the time

Pervasive Surveillance

All weather, all the time

- Space based
  - Visual/IR – many times per day
  - SAR - Capella Space – every 15 mins by 2027
  - EW – Hawkeye 360 - w/in 3 KM - hourly
  - 100,000 small sats by 2030

Coherent Change Detection

Commercial Satellite Imagery

Fast & constantly improving

PLANET LAB
Battle Damage Assessment
1 Day post-strike

Satellite + AI
Identify ship class

Pervasive Surveillance

- Terrestrial based
  - Cyber/Social Media – Continuous
  - Passive radar at the tactical level
  - Advanced EW
  - Advanced optical
  - Advanced acoustic

If you produce a signature,
You will be seen.

Surveillance Drones

- Endurance from 15 minutes to days
- Range - 15 km to thousands of miles
- Sensors – EO, IR, SAR, radar, EW
- In Ukraine
  - Initially – intelligence and fire direction
  - Now – critical combined arms system
  - Both sides using 100,000s per month
  - Ukraine plans 4,000,000 drones in 2025

Precision Mass

Artillery, rockets, drones, missiles

Artillery/rockets/missiles

- Swedish Archer 155 mm
- Range: 50 km
- Emplace, 3 rounds, displace
  - 72 seconds

- HIMARS – PrSM
- 800 km

- Lumberjack
- 320 km
- $100K

- Harop – loitering munition
  - 600 Miles – 50 lbs
- VTOL
- Autonomous – Visual, IR, EMS
- Operational in over 10 nations

- C-130 w/ Rapid Dragon
  - JASSM-ER – 600 miles
  - Longer range missiles available
- Allied use too

- XQ-58A Valkyrie
  - 3,000 miles – 1200 lbs
- VTOL
- $2-5 million
- 5 variants

Naval Surface Drones

- Ukraine – Magura V 2023
- 350 NM - 1,850 lbs
- 18 ft long
- $273,000

- Saronic Corsair
- 1000 NM – 1,000 lbs
- 24 ft long
- Autonomous/swarming
- 100s in 2025

Autonomous Underwater Vehicles

Anduril Seabed Sentry

- Autonomous
- Mobile
- Multiple options

Anduril Copperhead

- Torpedoes
- MV-22 delivery

Anduril Ghost Shark

- Autonomous
- Fits in FEU
- Multiple payloads
- All electric
- 1,000 mi/2025

200 sharks/year; 1,000s of Copperheads

Cheap Precision Mass

Platform Agnostic - autonomous

Anduril Barracuda

100 – 220 km, Helicopter

500 – 926 km, Fighter, cargo, container - $160K

1000 – 1600 km, Fighter, cargo, container -$1M

28 Barracuda 500s for 1 LRASM

Containerized Systems

Platform Agnostic

Missiles

ISR & Comms

Drones

Hide in Plain Sight

Iranian SAM

Estonian ASCM

Impact of Drones

- Nagorno-Karabakh - 70% of vehicle kills
- Ukraine – Russian vehicles destroyed
  - Summer of 2023
    - 42% of tanks
    - 39% of IFV
  - Early 2024 – 90% of vehicle kills
- Long-range strike – out to 2000 km
  - 17% of Russian Gasoline refining
  - Russian AF retreated

Countering Mass?

Direct Fire and Directed Energy

Direct fire

Gephard 35mm

UKR 12.7mm

- Advantages
  - Speed
  - Accuracy
- Disadvantages
  - Range
  - Magazine capacity

Vampire 2.75” Rockets

Directed Energy: Lasers and Microwave

- Advantage to land-based defense
  - Massive power generation advantage
  - Concealment
- Weakness
  - Lasers - smoke, haze, reflective coatings
  - Microwave – Faraday cages; hardened electronics

C4I:
Exploit advances

C4I - Ukraine

Demonstrated capability

- Delta – decision support/sit awareness
  - Runs on any platform
  - Routed through Starlink
  - AI assisted – Palantir
  - Inputs from sats, radars, sensors, phones
- Unit to national communications package

C4I

- Israel
  - Lavender – 37,000 people
  - The Gospel – 20,000 buildings
  - Where's daddy – active tracking
- United States
  - Army – Project Convergence
  - Navy – Project Overmatch
  - Air Force – Advanced Battle Management System
  - Joint Fires Network – deep strike weapons

Tactical Impacts:
C4I, Pervasive Surveillance, and Precision Mass

Irregular War

- Long-range precision strike; swarms
- Convergence favors non-state actors
  - Little infrastructure to protect
  - Weak drone/missile defense
  - State infrastructure vulnerable
  - Defense of logistics – civil and military
- Powerful role for outside sponsors
- Old tech still works

Oklahoma City
1995 3 tons

Ukrainian
Ammunition Depots
250,000 tons

Houthis
2024

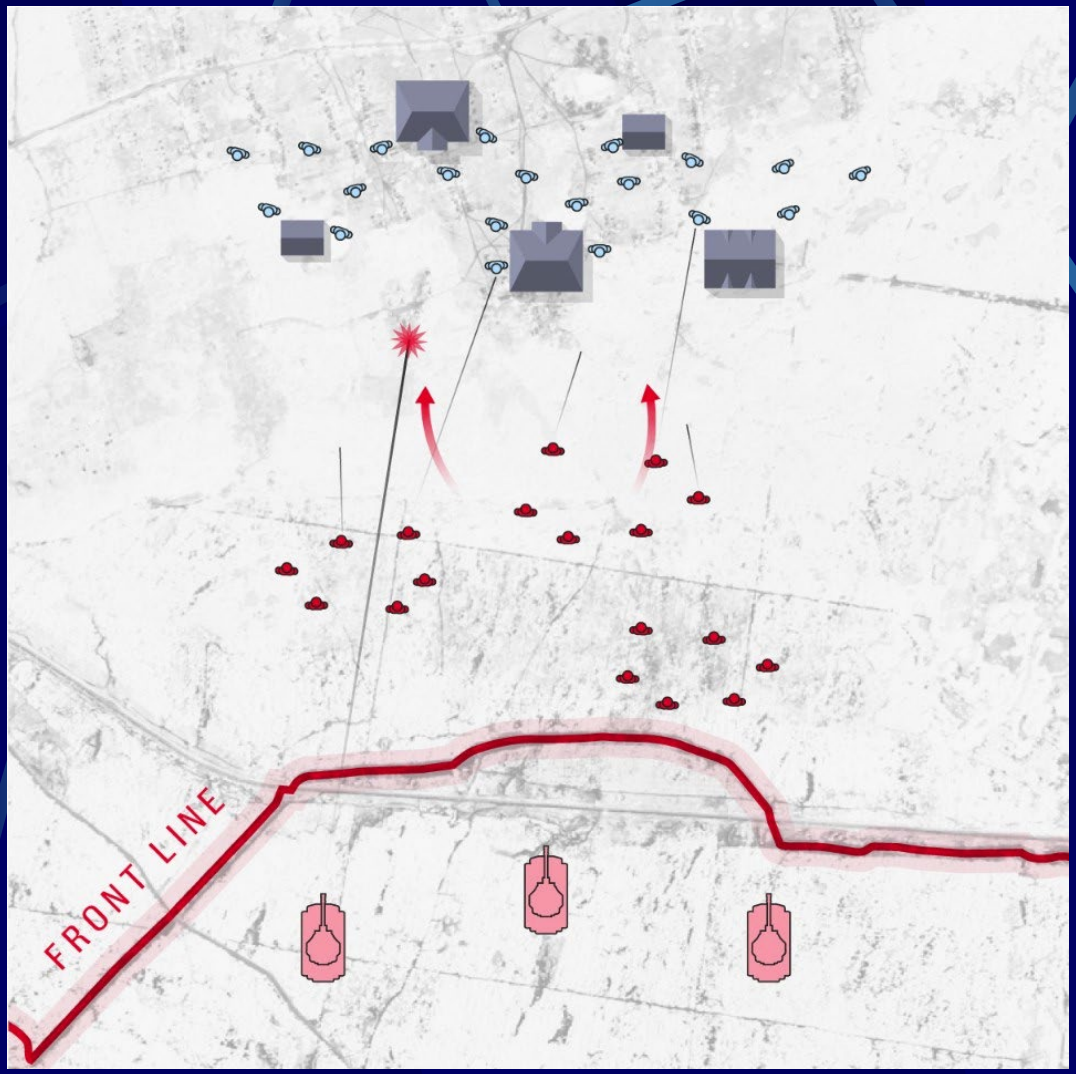
Bring the detonator

Ground Domain

- 15 – 30 Km Dead Zone
- Defense becomes dominant
  - Defenders stationary
    - Passive ISR
    - Dispersed weapons – massed combined arms
      - Artillery, rockets, drones, EW, direct fire, aircraft
  - Attackers move
    - Often must converge
- Numbers are essential
  - Sustained over time

Can you maneuver against 1,000s of hunters?

Russian 3-step Combined Arms



- Attack with untrained infantry
- Drones observe, ID targets
- Use glide bombs
- Occupy

Result: Minimal gains, massive casualties

Sea Domain

- Land defense dominant to increasing ranges – concealment/magazine depth
  - Confined seas mutual denied areas
  - Choke points closed – mines, missiles, drones
- Small states/insurgents challenge navies
- Weapons not platforms
  - Any ship can kill any other ship
  - # ship killers = # ships with containers

Missile Merchant

Warship in a Box Concept

Towed Array Sonar

Fuel Cell Generator

Container Drone Hanger

Container-Housed guns

Container-Based Missiles

Container-Based sensor

Container-Based Command Center

Additional crew berthing

8 Missile Merchants for 1 *Constellation* frigate

US carriers out of action

USS Oriskany – 1966
5 months

USS Enterprise -1966
51 days

USS Forrestal – 1967
9 months

Ford CV + Air Wing = 175 Missile Merchants + 7,000 missiles

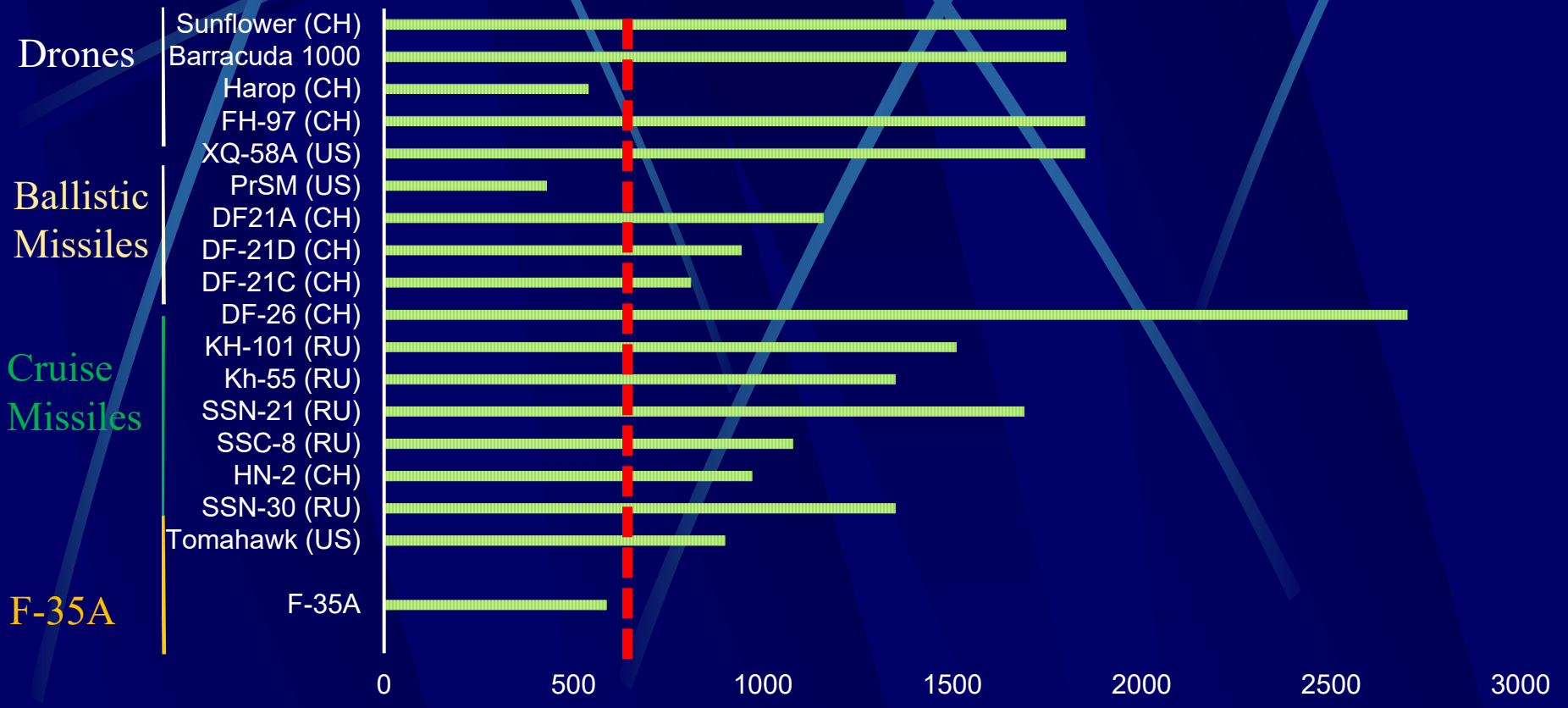
Air Domain

- Weapons not platforms
- Fixed bases become untenable
- Evolved cruise missiles and drones take over many missions
- With right weapons, mobile air defense denies airspace

Are manned aircraft range obsolete?

F-35A vs Missiles/Drones

Operational Range in Nautical Miles



Air Domain

Cost/Benefit Analysis

- Sunflower Autonomous = $100,000
- Barracuda 500 = $450,000
- XQ-58A Valkyrie = $3,000,000
- F-35A costs per aircraft per F-35 office
  - Lifetime cost = $855,000,000
  - 1 F35A = 285 Valkyries or 1,900 Barracudas or 8,550 Sunflowers
  - FMC – 855 Valkyries or 5,700 Barracudas or 25,650 Sunflowers
- Little or no maintenance for drones

Space Domain

- Heavily congested and contested
- Everyone has access to space
  - Surveillance, Communications, Attack
- Rapid space replacement evolving
  - Commercial space, drones, balloons
- Key issue = PNT for civilians

Cyber Domain

- Combined arms fight
- Conventional wisdom – offense dominated
- Ukraine shows
  - Contested
  - Continuous
  - Global

Electromagnetic

- The critical domain??
- Contested by combined arms
- Russia claimed 90% of drone kills were EW
  - Down to individual soldier
- China – Learning from Russia
- Driving long-range precision to GPS independent autonomy

Transition pattern

- Historical pattern – takes time
- Helper – Partner – Replacement
- Pike to musket; battleship to carrier
- Manned A/C to cruise missiles/drones
  - Helper – Gulf War I – IADS suppression
  - Partner – Gulf War II/Afghanistan
  - Replacement – Russo-Ukrainian War

Operational Implications

- Connected C2 critical
  - Must prepare to fight disconnected
- Defense dominates air, land domains
- Sea domain is mixed
- Space and electromagnetic contested
- Cyber uncertain
- Power projection much more costly

Strategic Implications

- Major Allied advantage in Europe/Asia
  - Geography favors the defense
- Smaller states/non-states deny major powers
- Greater allied contributions
- Mass production required
- National mobilization required

Some Questions

- Should operating concepts focus on defense?
- Payloads not platforms?
- Containerize everything?
- Production for long wars?
- Battlespace management?

The entire history the Marine Corps summed up

Contact Information

txhammes1@gmail.com