Uninhabited Aerial Systems: Disruption or Prescription?

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Where Everything Wants You To Die.
Disclaimer
Autonomous and Inevitable

Thesis: Autonomous systems will dominate the air domain within two decades

- Range
- Numbers
- Cost
- Vulnerability of bases
Key UAS technologies in short-term

- Small warheads
- 3D Printing
- Drones w/ task-specific Artificial Intelligence
- Cheap space
Small Explosively Formed Projective

Nano-energetics have 10X power of TNT
3D: Capability + Volume

Autonomous
50 KM Range
$800

10,000 to 100,000 a day
Mass Launch Drones

Small but deadly

1. Drones fired from launcher
2. Propeller and wings unfurl
3. Expendable drone ready for mission

“Swarm” of up to 30 fully autonomous drones work together to identify targets

- Length: 3ft (90cm)
- Speed: 70mph (110km/h)
- Max height: 20,000ft
- Max flight time: 90 mins
Cheap Space
Think Differently
Directed Energy: Lasers and Microwave

Advantage to land-based defense
- Massive power generation advantage
- Concealment

Weakness
- Lasers - smoke, haze, reflective coatings
- Microwave – Faraday cages
Historical pattern

- New concepts evolve with new tech
  - Assistant
  - Partner
  - Replacement

- Requires aggressive, honest experimentation
  - Dishonesty – French/Japanese/U.S.
  - Inertia and “unions” – British and US
Where is the Air Domain?

Replacement
- Persistent Surveillance – low threat
- High risk strike

Partner
- Deep strike, naval anti-surface, anti-air warfare, CAS
- Support – space and logistics

Assistant
- EMW / ASW / Communications relay
Immediate issue: Range Obsolescence

- Armored knight vs. pike formation or crossbows
- Pike formation vs. musket formation
- Battleships vs. carriers

Still superior but ... couldn’t survive to close the range

Marked cost advantage
F-35A vs Missiles/Drones
Range in Nautical Miles

- Drones
  - DX-3 (COMM)
  - Flexrotor (COMM)
  - Harop (CH)
  - UTAP-22 (US)
  - QX-222 (US)
  - DF-26 (CH)
  - DF-21A (CH)
  - DF-21D (CH)
  - DF-21C (CH)
  - HN-3A (CH)
  - KH-101 (RU)
  - Kh-55 (RU)

- Ballistic Missiles
  - SSN-21 (RU)
  - SSC-8 (RU)
  - HN-2 (CH)
  - SSN-30 (RU)

- Cruise Missiles
  - F-35A

Range in Nautical Miles:
0  200  400  600  800  1000  1200  1400  1600  1800  2000
Tradeoffs

- **F-35**: $140M, $65K per operating hour
- Loitering TLAM: $1.1M; w/ AM: $600K
- **QX-222**: $2M

1 F-35 or 230 TLAMs or 70 QX-222
15 more TLAM per F-35 squadron month
5 more QX-222 per squadron month

Only operating hour costs!!!
Conventional – Air Domain

- Attack 4\textsuperscript{th}/5\textsuperscript{th} generation aircraft and key enablers (AWAC, tankers) on ground
- Strike logistics & C2 nodes
- Evolved cruise missiles and drones take over most missions

Is manned fighter range obsolete?
Conclusion

- Autonomy is inevitable
- Lead the transition – two goals
  - Seize the advantages in each stage
  - Rethink operational concepts
    - Experiment ruthlessly
    - Bases are not off limits – let chips fall
    - Become an aerospace force
  - Study how others succeeded

Maintain “Air Mindedness”
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