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Disconnected by Design

5th- & 6th-Generation Aircraft in Disaggregated Collaborative Air Operations

J. Michael "JDAM" Dahm

Senior Resident Fellow
for Aerospace & China Studies

Disconnected by Design: Bottom Line Up-Front

- **China's informationized and intelligentized warfare strategies are purpose-built to break U.S. C4ISR to isolate and then strike U.S. forces**
  - The PLA seeks to disaggregate U.S. airpower, collapsing synchronization, massed effects, and decision-making

- **This report proposes Disaggregated Collaborative Air Operations (DCAO), an operational concept that adapts an effects-based operations approach but moves data fusion, decision-making, and coordination to the tactical edge of the battlespace**
  - Leverages the advanced technology of fifth-gen and next-gen aircraft

PLA Science of Campaigns (2006) & Science of Military Strategy (2020)

China AVIC – Cooperative & Intelligent Air Combat System (2018) (Photo: J.M. Dahm)

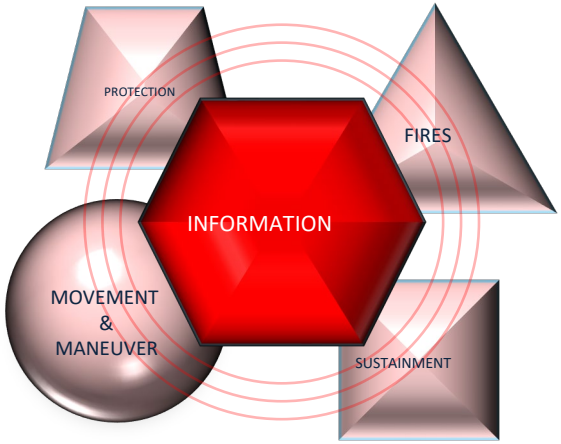
PLA Strategy to Defeat U.S. Way of War

The PLA built on lessons from U.S. campaigns – collapse an opponent's ability to sense, decide, and coordinate by rendering them "deaf, dumb, and blind," and then pick off the isolated elements with long-range fires

China's People's Liberation Army (PLA) seeks battlespace information dominance at all levels of warfare

The PLA's two-step combat strategy:

1. Disaggregate the enemy force by attacking its C4ISR system-of-systems (deceive, disrupt, and defeat U.S./allied sensing, communications, and battle management)
2. Strike fragmented and isolated elements with long-range precision fires; maintain constant pressure to constrain U.S. ability to maneuver, reconstitute, and heal networks



China's PLA places battlespace information dominance at the center of its operational concepts

PLA Strategy: Impacts on U.S. Airpower Ops

- **Render force packages deaf and blind isolating them from the joint force and each other**
  - The PLA's priority is to target critical nodes and long-range links through kinetic and non-kinetic means
- **Deny synchronization and the ability to aggregate mass**
  - By fracturing the U.S. C4ISR system-of-systems, the PLA seeks to prevent U.S. forces from achieving mass and massed effects; U.S. forced into slower, episodic, and vulnerable surges
- **Collapse U.S. networking assumptions**
  - Current U.S. concepts like the Joint Warfighting Concept (JWC) and the Air Force Future Operating Concept (AFFOC) rely on robust, continuous networking that "connects everything, everywhere, all at once" (long-range kill chains, synchronized pulsed airpower, expanded maneuver, JADC2 network/infrastructure)

USAF/USSF should not pursue force designs and operational concepts based on flawed assumptions about invulnerable, unlocatable comms/datalinks

Disaggregated Collaborative Air Operations

- **Disaggregated Collaborative Air Operations (DCAO)** is an operational concept for fighting inside highly contested airspace with **locally networked formations** that can still operate when **disconnected from theater-wide networks**
- DCAO relies on **fifth- and next-generation aircraft** to penetrate threats and **independently sense, coordinate, and execute** at the tactical edge of the battlespace with collaborative teams, including fourth-gen and uninhabited aircraft (CCA)
- It seeks to **deliver parallel warfare and effects-based outcomes** without depending on complex advance planning and fragile, long-range communication links

Photo: USAF, MSgt. Matthew Plew

Photo: USAF
SSgt. Daryn Murphy

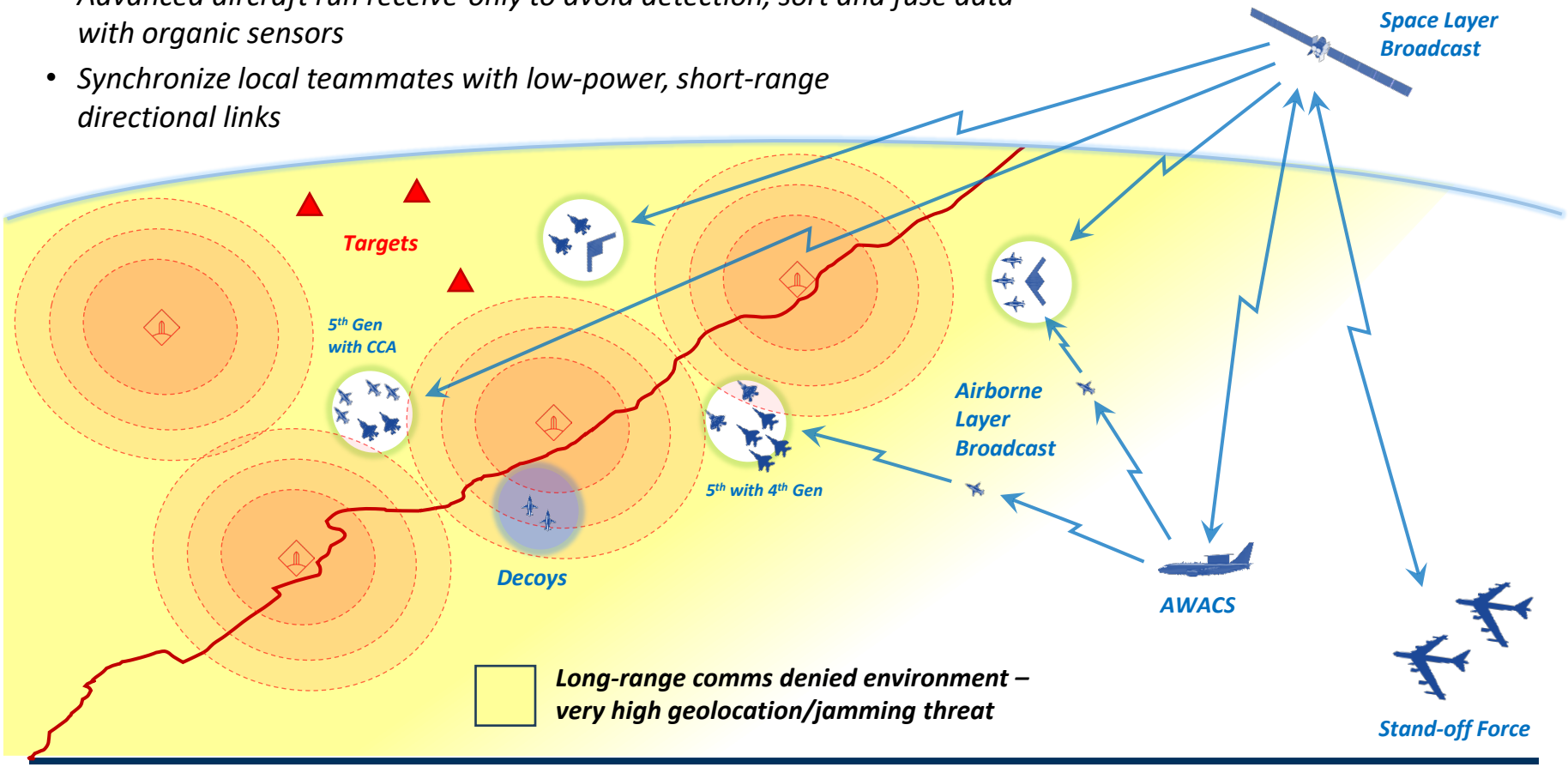
DCAO: Key Features and Attributes

- **DCAO is asymmetric to Chinese strategy.** Designed to sidestep PLA attacks on C4ISR networks, preserving U.S. battlespace information without relying on vulnerable long-range connectivity
- **Enables simultaneous operations & creates multiple dilemmas for the adversary.** Diverse force packages target multiple vulnerabilities at once; attacks adapt as adversary systems "heal"
- **Leverages stand-in vice stand-off capabilities.** Emphasizes penetrating stand-in forces that can complete kill-chains with organic sensing/processing, complemented by stand-off fires
- **Formations are small, many, and persistent.** Replaces episodic "pulses" with numerous small force packages (5th-gen + CCA + 4th-gen) that keep constant pressure on the adversary while disconnected from broader networks
- **Led by fifth-gen/next-gen aircraft.** F-22, F-35, and, as fielded, F-47 and B-21 form the core of each DCAO package, providing sensing, fusion, and battle management of teammates
- **Data and orders broadcast into battlespace.** One-way broadcast "mission orders" and ISR data are pushed forward; advanced aircraft run receive-only to avoid detection
- **Low-power comms enable teaming**. Local teams synchronized with low-power, short-range, directional links; countermeasures rely primarily on physics to limit enemy collection/targeting

DCAO C3 Architecture

Emphasizes data processing and decision-making at the tactical edge vs. always connected, positive control, reach-back dependent architecture

- *One-way broadcast of "mission orders" into comms-denied areas with volumes of ISR/targeting data*
- *Advanced aircraft run receive-only to avoid detection, sort and fuse data with organic sensors*
- *Synchronize local teammates with low-power, short-range directional links*



Evolving Parallel Warfare & EBO

Effects-based operations (EBO) is a concept that focuses on achieving a desired effect on an enemy through the synergistic application of the full range of military and nonmilitary capabilities at all levels of conflict

Parallel warfare is an approach that targets multiple critical systems simultaneously, including leadership, communication, and military infrastructure, to paralyze the enemy's operational capabilities

1991 Gulf War – Operation Desert Storm

1999 Kosovo Air Campaign – Operation Allied Force

DCAO Adopts Parallel Warfare & EBO Principles

1. Focus on objectives/effects (not attrition)
2. Conduct simultaneous operations across domains/axes
3. Target multiple adversary vulnerabilities at once
4. Decentralize command and control to speed decisions
5. Synchronize/integrate activities so actions reinforce each other
6. Continuously assess and feed back to adjust while in contact with the adversary

Challenge: *Classic EBO/parallel warfare required comprehensive advance planning and robust networking in execution, which the PLA strategy is specifically designed to counter*

Proposed Solution: Disaggregated Collaborative Air Operations (DCAO) moves data fusion, decision-making, and synchronization to localized networks at the tactical edge using advanced capabilities of fifth-gen/next-gen aircraft

Caveats: DCAO Operational Concept

- Disaggregated collaborative air operations is an ***operational concept*** that describes an approach to employing airpower
  - Operational concepts informally reflect the assumptions and intent of military leadership and form the basis for operational planning or military force design
  - DCAO offers a solution to counter near-peer strategies, operational approaches, and threats
  - DCAO *does not* necessarily address many enduring challenges for shorter-range stand-in forces in a near-peer conflict (basing, base defense, combat logistics, etc.)

- DCAO raises several issues that will need to be addressed in adoption and execution:
  - **Air Force capacity** – DCAO is not a "do more with less solution;" USAF must still grow the force
  - **Comms architecture** – Broadcast vs. everything always connected; integration of allied capabilities and older platforms – can USAF, other services, and allies build networks that do it all?
  - **Training** – Developing standards and experienced aircrew for decision-making in a comms dark environment; integrating formations with mixes of advanced aircraft, legacy aircraft, and CCA
  - **Trust and authorities** – "Back to basics" – To overcome vulnerabilities inherent in networked comms, leadership must embrace "mission orders," assume some risk, and allow aircrew to make targeting and engagement decisions at the tactical edge

Disconnected by Design: Recommendations

- **Adopt and develop DCAO as an operational concept**
  - Make fifth-generation and beyond aircraft the central, stand-in leaders for decentralized/disaggregated packages—using their sensing and onboard processing to orchestrate 4th-gen and CCA teams
- **Reduce dependence on centralized C4ISR**
  - Design operational concepts that keep combat forces effective without long-range, highly networked, centralized command systems
  - Build in broadcast mission orders and broadcast ISR that push data one-way into contested airspace, avoiding vulnerable two-way links
- **Modernize and scale fifth-generation and beyond forces**
  - Rapidly grow 5th-gen inventories to replace aging 4th-gen fleets; develop and acquire CCA, B-21, and F-47/NGAD PCA at scale
  - Leveraging open-systems architecture, prioritize continuous upgrades in sensors, computing, and propulsion to stay ahead of adversary countermeasures

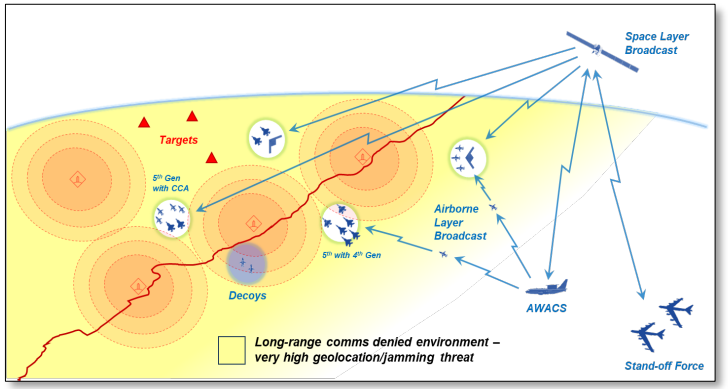


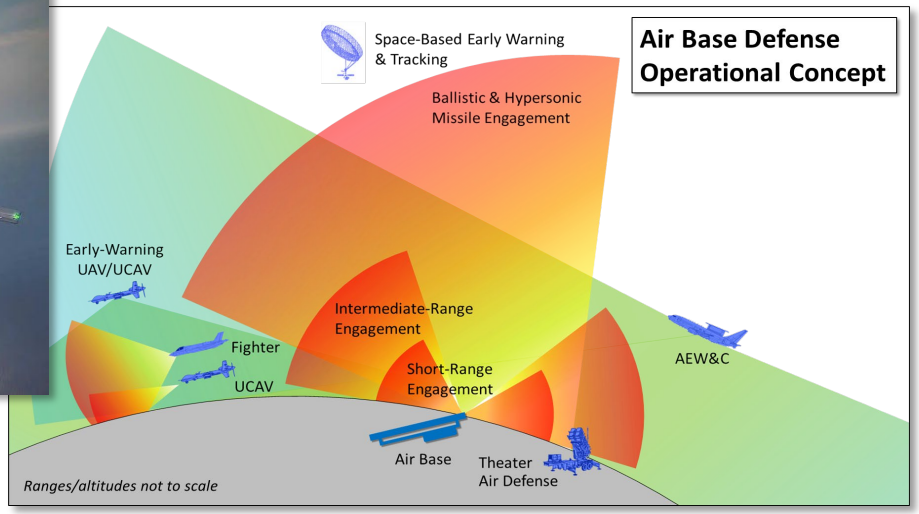
Photo: USAF SSgt. Kaylee Dubois

Disconnected by Design: Recommendations

- **Balance stand-in and stand-off forces**
  - Field a balanced mix that gives theater commanders flexibility and creates multiple dilemmas for near-peer adversaries—combining penetrating stand-in effects with stand-off fires

- **Expand forward base defense and hardening to enable DCAO**
  - "Double down" on ACE for hardening, dispersal, deception, and active defenses at Pacific bases so sortie generation can continue under episodic PLA strikes

Image: Lockheed Martin



Graphic: Mitchell Institute – "Fighting the Airbase" (2024)

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