# Network Optional Warfare

**Naval forces do not have to be engaged in constant centralized communication.** Deployed Navy vessels have demonstrated independence of action in stealthy coordinated operations for hundreds of years.

Littoral operations, deployable unmanned systems, and a refactored force mix for Navy and Marine Corps forward assets pose a growing set of naval challenges and opportunities.

Operational emphasis: opportunity to restore naval covertness and potential for tactical surprise, enabling fluid operations by fleet and marine forces across NCW and NOW.

## Network-Optional Warfare (NOW)

- *Major vulnerabilities are commonplace:* naval forces conducting constant communications lack stealth and become dependent on continuous data exchange.
- *Agile EMCON:* "Radio silence" emissions control with judicious use of low-probability of intercept (LPI) communication channels, such as optical.
- *Messaging maturity:* efficient compression and a coherently defined signal book, aiding remote command initiative and operational freedom of action.
- *Ethical Control of Unmanned Systems:* allow unmanned systems with potential for lethal force to operate reliably at a distance, directed by humans to follow same tasking + constraints as any other trusted participant.

## Network-Centric Warfare (NCW)

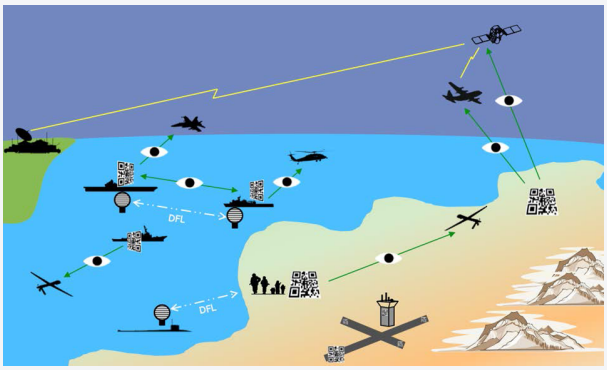
- “Seeks to translate an information advantage, enabled in part by information technology, into a competitive advantage through the robust networking of well-informed geographically dispersed forces.”
- “This networking—combined with changes in technology, organization, processes, and people—may allow new forms of organizational behavior.”
- Source: Network-Centric Warfare, Wikipedia

**Precepts and Pillars**

**Network-Optional Warfare (NOW) precepts for deliberate, stealthy, minimalist tactical communications include multiple technical arenas for naval opportunity.**

- Data Strategy for Autonomous Systems
- Efficient Messaging
- Ethical Control of Unmanned Systems
- Optical Signaling
- Rich Semantic Track (RST)
- Semantic Coherence
- References

**This work includes applied efforts in Field Experimentation (FX), Modeling, Simulation, and Analysis using open standards for scalability.**




**Operational View (OV-1) shows line-of-sight (LOS) optical signaling via Quick Reaction (QR) codes and Digital Flashing Light (DFL). Only two radio frequency (RF) lightning bolts!**

## Tactical Opportunities afforded by NOW

- *Stealth:* gain deeper access into battle space, utilize inherent covertness of unmanned systems.
- *Surprise:* choose time and place to shift from passive to active use of electromagnetic spectrum.
- *Coherence:* formal mission brevity codes are actionable and precise with well-defined semantics.
- *Uncertainty:* reduced opponent confidence that threats are located and attack is unchallenged.
- *Flexibility:* tactical commanders decide use of NCW/NOW on per-platform, per-mission basis.
- *Scalability:* incremental response using low-cost assets avoids destabilizing high-cost escalation.
- *Autonomy:* loosely coordinated command via Rules of Operation (ROO) and Engagement (ROE).
- *Cyber:* smaller "surface area" exposed to attacks employing EM radiation or network connectivity.
- *Asymmetric:* increased survivability and independence of action multiplies opponent difficulties.
- *Trust*: data-centric security and ethical human supervision of intermittently connected systems.

## Overview Resources for NOW

These references describe tactical techniques, operational concepts, and strategic possibilities that emerge when regaining asymmetric advantages.

- Network-Optional Warfare: Concepts Exploration and Enabling Technologies slideset.
- Network-Optional Warfare: Operational Employment Concepts lists component concepts of interest plus numerous relevant references.
- Network-Optional Warfare: Information Transfer Considerations analyzes the transition space between always-on NCW and all-off NOW operations.
- Network Optional Warfare: Overview Video (200 MB) produced for the NPS Littoral Operations Center (LOC) inaugural workshop, 24-26 March 2014.

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