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## Mine Warfare in Great Power Competition

Eldred, Ross A.; Simard, Matthew

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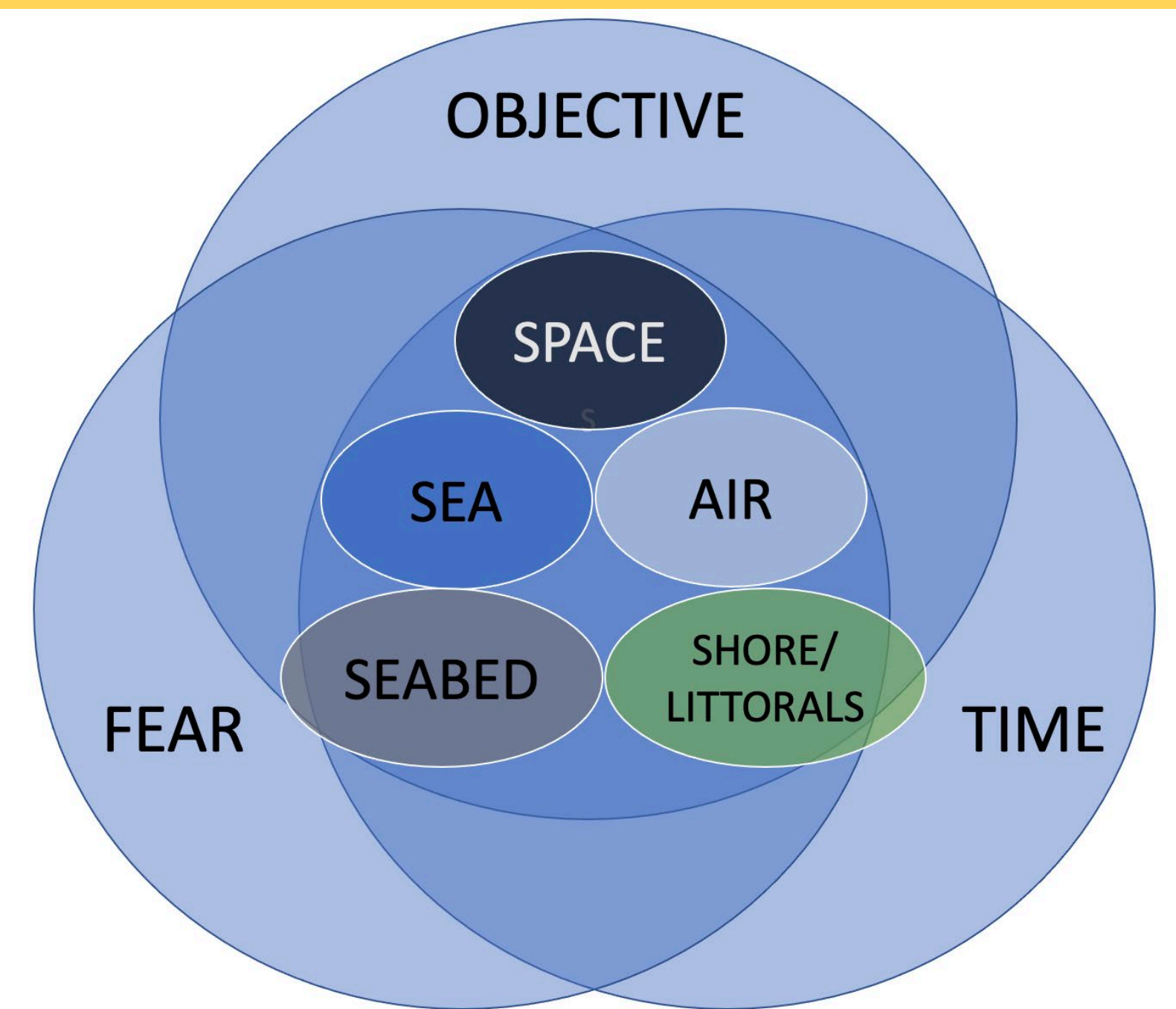
# Offensive Mine Warfare in Great Power Competition



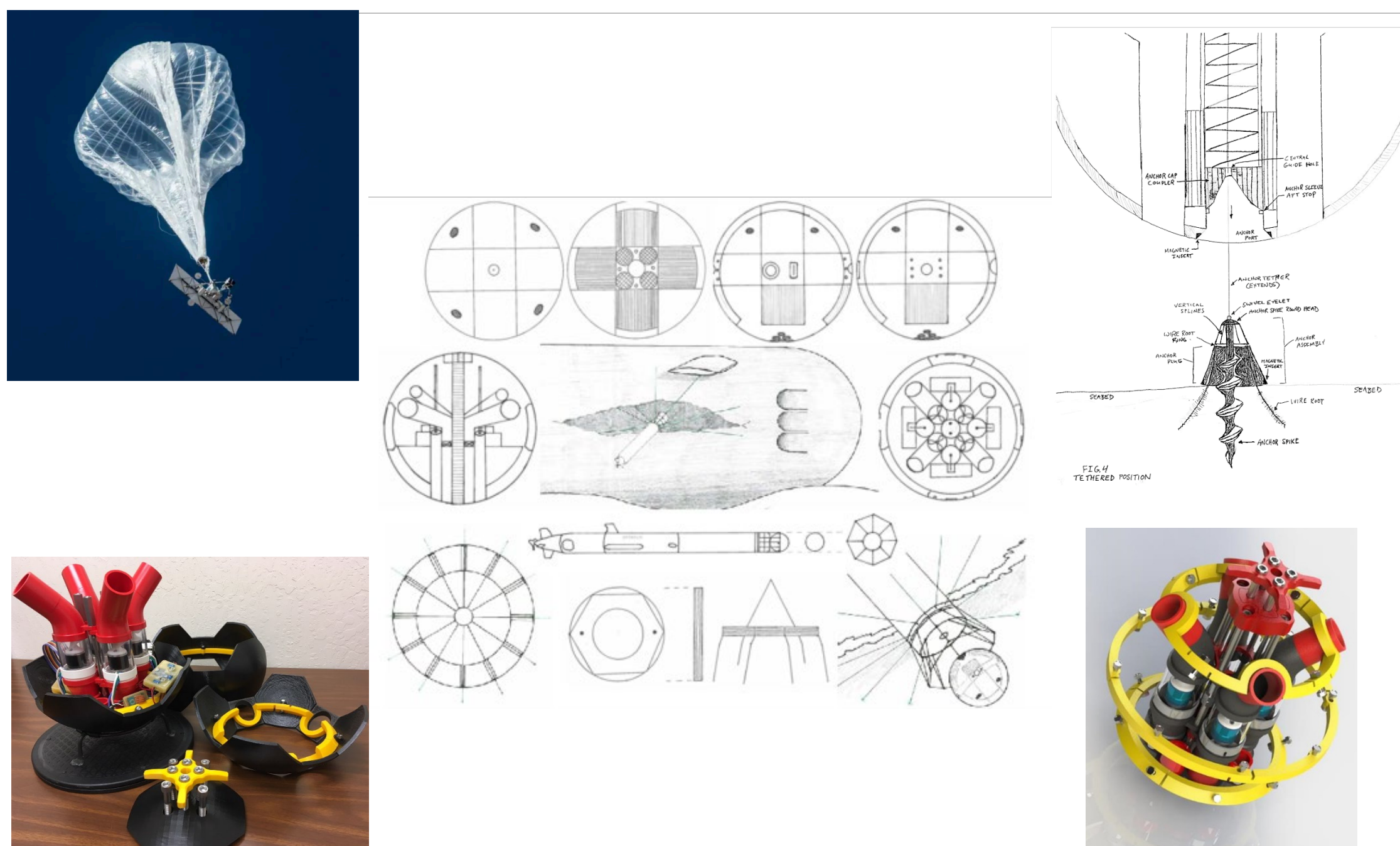
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## Strategic Context: *Shi*, the forceful reunification of Taiwan, and deterrence

- The ancient Chinese concept of *Shi* is applied to CCP grand strategy, focusing on the possible invasion of Taiwan and the role mine warfare might play when considered as an effects-delivery mechanism.
- Goal: To answer the question “What is a mine, and how might we increase the effectiveness of mine warfare in the context of Great Power Competition?”
- How: An application of systems thinking to link the physical and psychological aspects of offensive mine warfare, with special emphasis on the Grey Zone of conflict.



Eight physical and psychological factors defining the mine warfare problem space present opportunities for exploitation



WIEVLE, LTA gas expansion, and the RAATM: A potential disruptive payload delivery combination

## Capability gaps and opportunities for offensive mine technology development

- The Wreck Interior Exploration Vehicle (WIEVLE) is a spherical AUV prototype under development at the Naval Postgraduate School.
- The Resetting Anchor Antenna Tether Mechanism (RAATM) is a conceptual design for enhanced delivery vehicle mobility and network capability.
- Lighter-than-air cryogenic gas expansion (phase change) may vastly expand operational capability.

## CONOPS: The Kelp Road Initiative

The *Kelp Road Initiative* (KRI) is a new vision of offensive mine warfare originally conceived at the NPS 2021 Warfare Innovation Continuum (WIC) workshop. The KRI leverages *Shi* by developing the undersea battlespace with a pairing of subsea support infrastructure, built over time, with “effects-delivery vehicles” with potentially both positive and negative capabilities. Three levels of tactics, called “belts” are employed as the spectrum of conflict increases, providing significant utility in Grey Zone conflict, and creatively bridging the capability gaps derived from the problem space factors with new technologies.



Establish a vast network of resilient effects delivery mechanisms



Disrupt the adversary digital space



Assure friendly asset digital space

KRI Strategy: Pair **delivery vehicles** (the seeds) with **sub-sea infrastructure** (the kelp forest) for implementation across the spectrum of conflict

## Results and Recommendations for Future Work

- Journal Article: MDPI JMSE Special Issue *AUVs in Extreme Environments* (<https://doi.org/10.3390/jmse9030320>)
- Final Report “A Novel Approach to Mine Warfare System Design for Great Power Competition” submitted 31DEC2021
- RAATM: Provisional Patent Application No. 63/287,957, filed on 09DEC2021
- 2021 Mine Warfare Association (MINWARA) and Warfare Innovation Continuum (WIC) presentations
- Recommended future work - Research and Development of:
  - **Delivery Vehicles for Effects:** WIEVLE - A mission-configurable AUV platform for cross-domain operations from deep to littoral
  - **“Effects” (Payloads):** Rapid communications, EM spectrum “manipulation”
  - **Subsea infrastructure:** Methods for pairing delivery vehicles with effects-based payloads, distribution and support



**Researchers:** LCDR Ross Eldred  
Graduate School of Engineering & Applied Sciences, Systems Engineering Department  
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