



United States Joint Forces Command

The Future Joint Operating Environment Implications for Science and Technology

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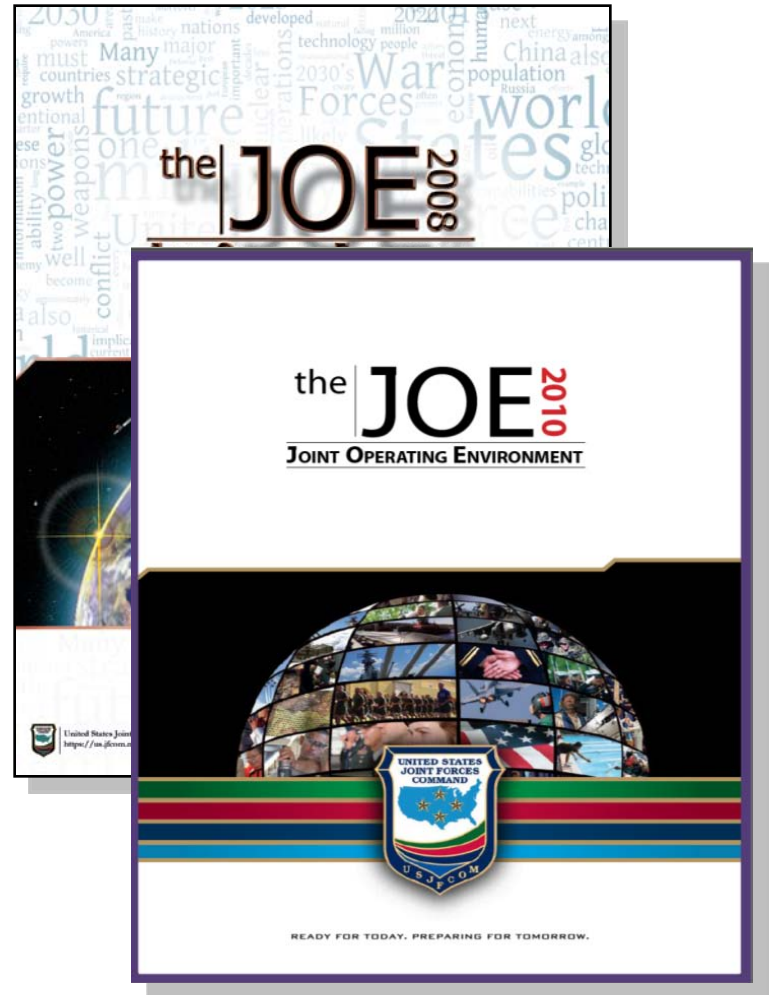
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JOE Purpose

- Provides the **problem statement** for the future joint force – the “demand signals” for JCDE
- Reviews the **trends** from the present out 25 years
- Analyzes operational **contexts** that will frame the future security environment
- Anticipates **disruptions**
- Forecasts the **implications** for the joint force



“We won’t get it all right – but we can’t afford to get it all wrong”



JOE: Trends Influencing the World's Security



Demographics – Population growth/decline, age disparities, migration, sprawling urban areas



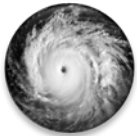
Globalization – Rising powers, interconnections, and inequalities



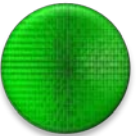
Economics – Trade imbalances, rising expectations vs. failing economies



Resource Scarcity – Competition for water, energy, food



Climate Change & Natural Disasters – Sea level, storms, growing coastal populations



Cyber – Exponential growth, advantage, vulnerability



Space – More have access, defense of US space assets



Technology – Exponential growth, ubiquity, lower cost of entry – to include CBRNE technologies



...leading to Contexts of Conflict and War

- **Cooperation and Competition among conventional state powers** will provide a number of challenges and threats to the joint force
- **Weak and failing states** will require engagement and cooperation
- **Large, sprawling urban areas** with dynamic pressures in which the joint force must operate
- **Threats from Unconventional states** and **non-state powers** that will confront us with new and innovative ways to wage war
- **Battle of Narratives** will bring populations directly in touch with joint force operations and shape perceptions
- **Defense of the US Homeland** will require operations abroad and at home

Contexts are the confluence of two or more trends and illuminate why wars occur and how they might be waged.



Contextual S&T Implications (Near Term)

- Longer-range, more-precise weapons are more widely available and cheaper – this has anti-access implications.
- Operations into remote and under-governed spaces have unique ISR requirements and implications.
- Urban areas offer shelter from U.S. advantages in ISR and fires.
- Separating adversaries from civilian populations in urban settings will be critical, but very difficult.
- Identities forged via the internet and other communications technologies will compete for nation-state allegiance.
- Technology, WMD proliferation, and globalization will bring homeland into reach – US bases not immune.
- Protection of “homeland” will include elements of space and cyberspace.



Contextual S&T Developments (Mid-term)

- Information, bio, and nano technologies are merging:
 - Real world embedded with computational devices – including the human body itself.
 - Robotics ubiquitous and linked to the world through wireless networks.
 - Real-time, near ubiquitous multi-spectral remote sensing.
 - Real and virtual worlds more deeply linked.
 - Access to massive amounts of data + sophisticated computational tools = more powerful simulation tools widely available.
 - Fab-labs, desktop manufacturing devices, “garage” biolabs.
 - Modification of the world around us available at the smallest scales.

These capabilities will be available to all at lower costs for entry



The Nature of 21st Century Warfare

- **Adversaries examine & circumvent how the U.S. wages war**
- **Adversaries will adapt military practice to:**
 - Construct a mix of conventional, irregular warfare, and nuclear threats
 - Blur the line between political conflict and open war
 - Place U.S. forces in strategic dilemmas by developing strategies to avoid our advantages and confront us with their own asymmetries.
- **Adversaries will use:**
 - Globally ranging networks and open-source capabilities (internet, commercial navigation and imagery).
 - Increasing technical equality to make anti-access strategies challenging in all domains.
 - Mobility, precision fires, and information on U.S. forces while contesting our ability to respond.
- **Friction is unavoidable - Surprise will still be a major factor**

Must build a force that is Adaptable, Agile, and Resilient



JFCOM Near Term S&T

- **Training & Education Focus/Opportunities**
 - **Create T&E Technology that:**
 - **Is User focused - easy to use**
 - **Is executed with Minimal downtime**
 - **Has Reduced reliance on contractor support**
 - **Is easy to recall by troops**
 - **Is Adaptable to differences in learners & environments**



JFCOM Near Term S&T

- **Training and Education Opportunities (cont)**
 - **Create Technology that:**
 - **Minimizes cognitive and data overload**
 - **Provides decision support at the Joint level**
 - **Promotes understanding of**
 - **different cultures,**
 - **histories,**
 - **politics,**
 - **personalities**
 - **Teaches/stresses Joint team skills**



JFCOM Near Term S&T

- **Modeling & Simulation Opportunities**
 - Special attention to ground force simulation while maintaining emphasis on air and maritime
- **Replicate:**
 - High intensity, complex, stressful Joint environments
 - Urban and human terrain
 - Cultural environment in which Joint warfighters operate
 - Joint tactical and operational difficulties
 - Joint stable, relief, and engagement operations



JFCOM Near Term S&T

- **Modeling & Simulation Opportunities**
 - **Build Systems with which JFCOM can:**
 - Train
 - Experiment
 - Test & Evaluate
 - **Build in multiple levels of security**
 - **Make systems interoperable**
 - **Measure performance in Joint contexts**



JFCOM Near Term S&T

- **Defense Economics, Acquisition, and Personnel**
 - **Economic warfare – Money as war**
 - **Office of Research and Technology Applications (ORTA)**
 - **JFCOM Product transition**
- **Science, Technology, Engineering, & Math (STEM) Education**
 - **Focus on the future**
 - **Continue to support**



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