



NAVAL POSTGRADUATE SCHOOL
SUPPORT FOR COMBATANT COMMANDERS
 and the
OFFICE OF THE SECRETARY OF DEFENSE

The Naval Postgraduate School's unique combination of operationally experienced students and defense-oriented faculty provide a superb setting to conduct interdisciplinary research on complex issues related to national and homeland defense. As such, many of the research and academic programs at NPS relate to the operational level of war. A number of projects at NPS are performed directly for or in support of the various U. S. Combatant Commands, or are conducted side by side the Commands as part of larger integrated field experiments. Other NPS projects support or are supported by the Office of the Secretary of Defense (OSD). While many of these projects are classified, below are some unclassified examples of NPS support to the Commands, Fleets & OSD.



USPACOM
Pacific Command

Campus-Wide Integrated Project to Study Undersea Warfare in the Littoral. Thirteen System Engineering and Analysis students will lead a campus-wide integrated study on the challenges of Undersea Warfare in the Littoral. This work will focus on most challenging threats and will involve coordination with COMPACFLT, ASW Command, and TF ASW.

Campus-Wide Integrated Project to Study Maritime Counter-Terrorism in Southeast Asian waters. Twenty System Engineering and Analysis students are leading a campus-wide integrated study on defeating maritime terrorism and pirate-supported terror in the Southeast Asia waterways. NPS Singapore students will be integrated into this study. PACOM Science Advisor is aware of this project in consonance with PACOM's maritime domain ACTD proposal.

Coalition Operating Area Surveillance & Targeting System (COASTS). Develop and implement low cost, state-of-the-art, unclassified testbeds in partnership with coalition allies to reduce or mitigate border and port security vulnerabilities, and leverage & expand research through other NPS programs. COASTS uses sensors on manned and unmanned platforms, in combination with 802.11 and 802.16 wireless technologies to provide situational awareness overlay. Participants include USPACOM, NSA, US Border Patrol, US Coast Guard, Coalition Partners, Thailand (current), Singapore, Korea & others (proposed).

Southeast Asia Tsunami Relief: Hastily Formed Networks—Phuket & Khao Lok, Thailand. Taking advantage of a pre-arranged visit to Thailand by NPS faculty, NPS was able to support tsunami relief operations “on the fly”, providing broadband internet to victims, families, NGOs, local government, media, and volunteers. NPS organized a team of participants from COASTS (a NPS integrated research project), and in-country agencies to set up a hastily formed network ISO tsunami relief. Many lessons were learned and reported. NPS faculty returned in mid-February and mid-March to enhance the network and build in redundant, remote monitoring/imaging capability.

Joint Defender TBMD Modeling. A PC-based operational planning tool for use by area air defense planners is being developed by Operations Research faculty and students. This model was tested in an unclassified Korean scenario and used to aid Naval War College in PACOM CONOPS (Concept of Operations) evaluation. It is being evaluated by NWDC staff for further development.

Unmanned Vehicle TACMEMO Development and Field Experimentation. In addition to TACMEMO (Tactical Memorandum) development for utilizing UAVs in Maritime Missions, NPS faculty and students are designing a field experimentation program with Singapore and Thailand for use of UAVs for ISR.

Regional Security Education Program (RSEP). NPS faculty teach on Carrier Strike Groups and Expeditionary Strike Groups in-transit, delivering graduate level education to forward-deploying forces, to enhance their strategic situational awareness and enable them to understand the regional threat environments in which they operate. Using in-person lectures, direct interaction with regional experts, and a supporting website, RSEP provides strike group Commanders critical and timely regional security knowledge, strategic level perspective, knowledge in support of forward engagement, theater security operations, bilateral/coalition cooperation, improved mission planning and current cultural and societal issues. Past presentations have focused on Middle East, Iraq, NE and SE Asia, DPR Korea, Horn of Africa, and China.

Maritime ISR and Detection (MISRAD). NPS hosted an inter-agency workshop on MISRAD under the auspices of PACOM. The workshop looked at the end-to-end supply chain that moves containers from the overseas manufacturer through the maritime traffic system to ports in the US. The particular focus of MISRAD is on WMD, particularly nuclear devices and special nuclear materials. The MISRAD group brings operators, sensor producers, intelligence professionals, port operators and shippers together to attack this problem from all sides.

Maritime Domain Protection. NPS drafted a proposed National Maritime Domain Protection Architecture with Concept of Operations and Command Structure. NPS also tested the proposal in an interagency/joint war game, developed a MDP Library Base for classified interagency reference, and extended current data mining and fusion techniques and systems based on

requirements generation. We are now examining port infrastructures in support of force protection.

Center for Executive Education (CEE): Development program for transition in USPACOM intelligence. Application of NPS' CEE program to J2/JICPAC leadership and unique theater intelligence management needs. This CEE education program provides frameworks/tools for the leadership team to input to intelligence strategy, implement change, and shape organizational structure and processes.

Center for Civil-Military Relations (CCMR). CCMR supports the PACOM Theater Security Cooperation Plan and the Global War on Terrorism by helping improve U.S. influence in the Asia-Pacific Region in Southeast Asia, the South Pacific, South Asia and Indian Ocean, and Indonesia, Taiwan and Bangladesh in particular. CCMR programs focus on improving access, training and readiness in these regions and developing competent coalition partners. CCMR provides in-residence courses and Mobile Education Teams (MET's) to participating countries, to instruct in Planning Peace Operations; Civil-Military Relations; Democracy: Methods, Techniques & Application; Developing Simulations/Scenario Development Training; Strategic Planning; and Response to Global Terrorism. CCMR contribution to PACOM planning helps establish strategic communications for creating regional dialogue on U.S. security policy in PACOM's area of responsibility.

Concept of Operations (CONOPS)/Tactics/Techniques/Procedures (TTPS) for foreign language/speech translation technologies in a coalition military environment. Research in foreign language and speech translation machine technologies for the Advanced Concept Technology Demonstration (ACTD) titled "Language and Speech Exploitation Resources": (LASER), currently in its fourth year. This research utilizes the LASER ACTD process to study how various foreign language machine translation technologies can be used in a DOD environment, & focuses on the creation of CONOPS and TTPS for the employment of these technology devices in military exercises& ops.

COMTHIRDFLT Science Advisor tour. Richard Kimmel (NPS/IS department) was selected for the Office of Naval Research Science & Technology advisor program, is detailed to COMMANDER THIRD FLEET (C3F), San Diego, CA.

NPS USPACOM Liaison Desk: Provides research support as requested by USPACOM Science Advisor and J39 in support of experimentation. Examples include web based influence operations for exercise COBRA GOLD 04 in conjunction with NPS liaison desk for USPACOM: support, construct and operate a cyber-based capability to support the planning and execution of full-spectrum information operations. NPS developed and provided a fully functional prototype website for implementation during the COBRA GOLD 2004 command post exercise.

Support to USARPAC (US Army Pacific) for Homeland Defense. Provides education, applied research, training, exercise and planning program support to strengthen DoD's capabilities for terrorism prevention and all-hazards response in the Pacific area of responsibility.

Direct Support to CTF-73 to evaluate HSV in PACOM. An Ops Research student is conducting research on the use of HSVs in a logistic role for CTF-73 and how to modify contingency support plans.



USCENTCOM Central Command

Direct NPS Educational Support to CENTCOM. CENTCOM Area of Responsibility (AOR) countries send their officers and defense civilians to NPS for master's degrees and to attend in-residence short courses ranging from one to eleven weeks. NPS also sends mobile education teams to countries in CENTCOM AOR to assist in the development of democratic policies and programs. Most recently a team of educators went to Afghanistan, and will do the same in Iraq. NPS also conducts region and country specific education programs for active Army, National Guard and Reserve Forces deploying to CENTCOM AOR, to include Iraq and Afghanistan. In addition, NPS conducts regional security education of sailors and marines deploying to CENTCOM AOR.

Helicopter Brownout. Helicopter Brownout is a \$100 million per year problem, leading to significant hardware loss, injuries, and fatalities. The NPS project objective is to find ways to define landing zones which will have reduced probability of producing brownout. The challenge is to remotely sense soil and surface characteristics in denied territory. Both civilian remote sensing systems and national technical means were and are being studied. NPS identified a system that meets the requirements and is testing it for suitability. The payoff for this work will be to dramatically reduce the loss rate for men and hardware, particularly in the SOCOM and CENTCOM AORs.



Defense Resource Management Institute at NPS: 1,710 participants representing 25 of the 27 CENTCOM countries have participated in DRMI programs since 1965, including the current King of Jordan, his brother and his sister. In the last 10 years, NPS conducted mobile courses in Ethiopia (2), Jordan, Kenya (5), Tajikistan and Uzbekistan. Prince Feisel of Jordan commented on the value of networks from his time at NPS, noting that he was amazed that he had to come all the way to Monterey to meet other people in his region of the world. He said he now felt that he could just pick up the phone and call them when there is problem.

Coalition Intelligence Architecture Development. NPS faculty member traveled to MacDill AFB in Florida, As Saliyah in Qatar, and Baghdad and Basra in Iraq in Jan/Feb 2004 to write a study recommending improvements to the Coalition and Iraqi intelligence architecture, for General John Abizaid, Commander CENTCOM. He worked as a member of General John Abizaid's personal staff, in the Commander's Advisory Group.

He then traveled to Kuwait City in Kuwait, and Baghdad in Iraq in Oct/Nov 2004 to work as a member of the Strategy Division of the office of the Deputy Chief of Staff for Strategy, Plans, and Assessment (DCS-SPA) in the headquarters of the Multinational Force-Iraq, in the US Embassy in Baghdad. The DCS-SPA, headed by a US Air Force major general, worked directly for General George Casey, Commander MNF-I, who is directly subordinate to General Abizaid.

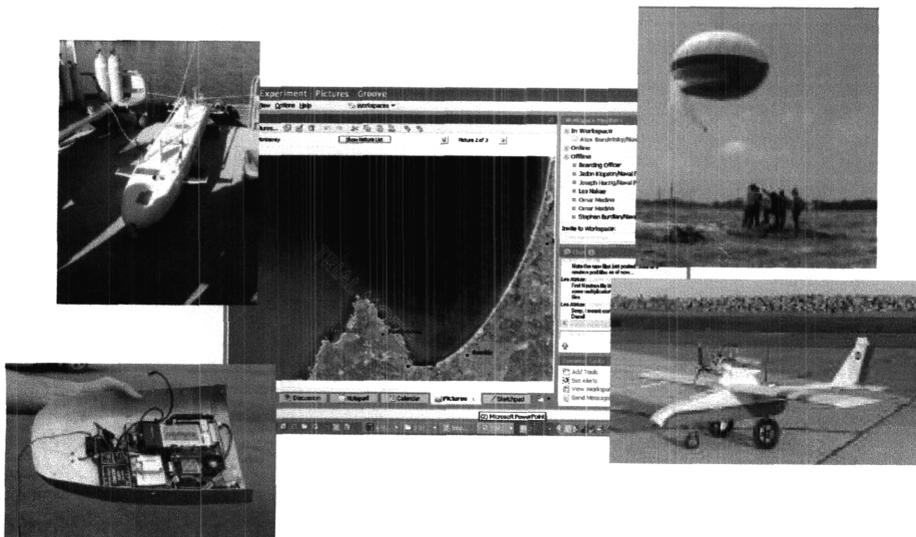


USSOCOM ***Special Operations Command***

Man Hunting Workshop in support of U. S. Special Operation Forces (SOF). The traditional scope of military operations has never developed a doctrinal framework or process to capture fugitives, consequently military planners and intelligence analyst are not educated or trained in the investigative processes necessary to find fugitives. NPS conducted a research seminar to develop an investigative framework to understand the nature of man hunting in order to locate and apprehend fugitive insurgents and propose developmental courses of action.

Tactical Network Topology (TNT) (previously STAN). TNT is an integrated program of quarterly field experiments that develop and demonstrate new technologies to support near term needs of the warfighter. Major emphasis is on wireless networks, autonomous vehicles, sensor networks, situational awareness and target tracking and identification. Measures of performance of the technologies and operators using the technologies are also addressed. TNT is a faculty-student program working in parallel with partners that include various branches of the military, Combatant Commands, industry, and national labs. In particular, USSOCOM's Futures Directorate (J9) will be conducting experiments at NPS in conjunction with the USSOCOM Advanced Technology Directorate. These experiments will focus on identifying key gaps and deficiencies resulting from applications of advanced technology, particularly network communications, unmanned systems, and net-centric applications.

TNT includes a wide range of projects including the light reconnaissance vehicle (LRV) and special operations force (SOF) systems engineering and integration. The latter is an umbrella project to provide systems engineering applications to USSOCOM in support of all NPS work on LRVs, to integrate NPS experimental efforts and develop case studies.

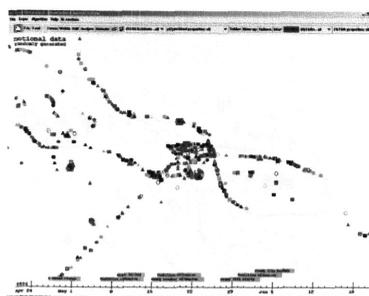


Special Operations Forces SIGINT Maritime Support to Joint Threat Warning System, (JTWS) Research, Development, Test, and Evaluation. This proposal describes Research, Development, Test, and Evaluation (RDT&E) actions, to support the Joint Threat Warning System (JTWS) Program. This will include investigating integration of smart dust technology into the JTWS Component Architecture Framework (JCAF), investigations into integrating SOF SIGINT maritime capabilities into the Tactical Network Topology effort, and classified signals analysis.

Applied warfighter Ergonomics (AWE) Research Center. This research incorporates the Human Systems Integration (HSI) research efforts to support the Tactical Network Topology (TNT) project. There are two major areas: HSI assessments of field portable devices and a research center with lab and field based research capability to assess human systems integration efforts for warfighters. The thrust of the effort will be on assessment of field portable devices to be used by warfighters.

Skytrack: Broadband switched-beam UAV-to-land vehicle communications subsystem. This is a project to develop, implement and validate a mobile UAV tracking antenna subsystem to operate with multiple UAV signal sources, in the 2.4 and 5.8 GHz ISM frequency bands.

Dynamic Mapping of IED Incidents over Space and Time. Innovative thesis work uses software from a faculty research project to display, animate, and statistically analyze the SIGACT (significant activity) data from Operation Iraqi Freedom (OIF). Identifying change points in insurgency behavior is critical to effective counterinsurgency. Due to the continuous nature of the conflict and the volume of apparently random incidents, statistical process control techniques are used to signal changes in insurgent tactics and movement. This research by faculty and students at NPS continues to improve the programming components of the project. The NPS IED mapping program is also currently being used in-theater in Afghanistan in Operation Enduring Freedom.



Case Studies for the Future. To assist in the development of operational concepts for Special Operations Forces that can be tested in exercises in theatre. Tools such as case studies, statistical analyses & mathematical modeling are used. A series of briefings and research papers are being developed, delivered, with supporting documentation, including proposed exercises plans to incorporate research results into SOF training.

Special Operations/Low Intensity Conflict (SOLIC) Academic Curriculum. Unique curriculum designed to provide students with the ability and background to think analytically and originally about the broad fields of political violence, unconventional warfare, and the role of SOLIC in U.S. foreign policy and defense planning.



USJFCOM *Joint Forces Command*

Support for Extended Awareness Experimentation program. NPS provides experimentation and other analytic support to the Extended Awareness series of experiments, conducted by the Joint Operational Test Bed System (JOTBS) under USJFCOM. This includes involvement in the planning and conduct of the events leading up to two limited objective experiments.

NPS/CIRPAS UAV Predator flight support. This project supports JFCOM's UAV test objectives with Pelican and Predator air vehicles and one GCS/GDT.

Joint Intelligence Interoperability Board (JIIB) Systems Baseline Assessment (JSBA 04). This project supports the assessment of the Joint Intelligence Interoperability Board Systems Baseline Assessment. The study examines requirements and methodologies; organizes and maintains JSBA analytical models and tools and the associated data; executes model run activities, and analyzes results. NPS also provides analytical support, including scenario development and verification, execution of model runs, and direct analyses for a variety of intelligence, surveillance, and reconnaissance (ISR) assessments.

Extensible Modeling and Simulation Framework (XMSF) viewer for the Distributed Continuous Experimentation Environment (DCEE). The distributive continuous experimentation environment (DCEE), managed by the J9, U.S. JOINT FORCES COMMAND, has established a framework of common terminology for information to be exchanged between components using an enhancement of the real-time platform reference federation object model. This project will prepare for and conduct a demonstration of the benefits of XMSF concepts in the DCEE with the XMSF DCEE viewer.

Standing Joint Force Headquarters Process Modeling. The Standing Joint Force Headquarters (SJFHQ) processes will be analyzed and modeled to capture new processes that emerge with an emphasis on inter-agency, and service/functional component interactions. Information on SJFHQ will be obtained from available J9 sources, from observing planned events at PACOM, EUCOM and SOUTHCOM, interviews, and the development of use cases and user stories. Paper process models will be developed to show information flow timelines. Outputs of executable simulations developed from paper models are provided as inputs to discussion of requirements and end states.

Joint Task Force requirements determinations. This research will document the rationale, establishment and operation of recent JTFs, conduct a literature review of JTFs from military and academic sources to provide lesson learned for future JTF development and operation, develop a research protocol to be used in identifying and evaluating the decision processes, and procedures and mechanisms through which JTF are formed.

Design and analysis of simulation for advanced joint C4ISR node. This project designs, implements and analyzes the results of simulations to examine the costs and benefits of AJCN payloads following the statement of work from JSJFCOM. The intent of the simulation, for example, develops a cost-benefit analysis to determine the advantages of multiple AJCNs on single platforms, and helps develop TTPs for employing AJCNs.



USNORTHCOM ***Northern Command***

Homeland security leadership development. Under a MOU with USNORTHCOM, NPS develops and provides graduate education and research programs for USNORTHCOM in the area of homeland defense and security, and other MS programs in fields of direct value to HD/S. In addition, NPS takes HD/S mobile education teams (METs) to governors, and state and local leaders for short courses in first response and HD/S issues.

Center of Excellence in learning technology support for Homeland Defense and defense support to civil authorities. This project determines how Advanced Distributed Learning can best be used to reduce costs and constraints, and improves effectiveness of pre-exercise education, training and coordination. Determines how ADL can be used to individualize and tailor training and education for individuals performing the entire spectrum of homeland defense and military support to civil authorities operations.



OFFICE of the SECRETARY OF DEFENSE (OSD)

Armoring Vehicles against Improvised Explosive Devices IEDs. Supporting a request from the Office of the Deputy Secretary of Defense, NPS faculty and students are working on a short term project exploring protection schemes that have the potential of decreasing the vulnerability of lightly armored vehicles, such as Bradley APCs. Initial concepts will be assessed for increasing absolute protection and weight efficiency of armor, using lightweight assembly of discrete elements, arrayed in a manner that increases the number of angled contact surfaces that a projectile will have to encounter. This serves to deflect the flow of bomb fragment streams out of harm's way. The initial work on this project simulates an IED class bomb, and assesses the baseline effectiveness of steel armor against the threat. The project uses technical surveys and supporting data from SPAWAR and LLNL, with NPS faculty/student expertise in explosive ordnance and testing, shaped charge development, effectiveness analyses, hydrodynamic code development and simulation.

Voice Authentication "Iraqi Enrollment" Project. The Voice Authentication "Iraqi Enrollment" Project is an initiative that explores the use of voice authentication and verification technologies for implementation in Iraq and potential uses in other stabilization and reconstruction efforts, such as Afghanistan. This faculty/student project is examining a proof of concept for a voice authentication and verification system that can improve visitation screening for detainees at the Baghdad Detention Facility Abu Ghraib, and security screening for access to the International "Green Zone."

World Wide Consortium on the Grid (W2COG). OSD sponsors the World Wide Consortium for the Grid (W2COG) initiative to accelerate fielding of network centric operations capability by matching *top down* governance for Global Information Grid (GIG) policy with *bottom up* meritocracy for technical detail. W2COG uses operational mission thread analysis, field

experimentation, and demonstration to identify the imperatives of GIG architectural detail and follows the "open" model of the World Wide Web consortium wherein technical experts from global industry, academia, and government join in a distributed, efficient, repeatable process to consider ideas and artifacts on their merits and achieve rapid consensus. OSD offices supporting W2COG include Office of Force Transformation, Advanced Systems and Concepts, Networks and Information and Integration, DARPA, DISA, and JS J6.

Human Intelligence in the War on Terrorism: Defining the Problem. The goal of this project is to comprehensively describe and analyze the gaps in US human intelligence capabilities when operating in the non-Western world; to identify non-western means of securing support; to assess current capability for taking action against these methods; to apply organizational theory to intelligence organizations in terms of potential to operate effectively in the non western world; and to examine how other great powers penetrated the non-western world for intelligence collecting purposes.

Improving and Incorporating Cost Estimating and Analysis into Advanced Concept Technology Demonstrations (ACTD). This project examines how to provide OSD decision makers with improved, consistent, credible and reliable cost estimates for use in the ACTD program, to include enhancing understanding of the unique characteristics of ACTDs and the relevance of incorporating cost estimating and analysis into the ACTD selection and transition processes.

Office of Force Transformation. NPS supports the Office of Force Transformation (OFT) in several areas. *Large Scale Change and Defense Transformation* applies interdisciplinary expertise to large-scale change issues associated with Defense Transformation, integrating research from various disciplines related to people, process, organizations and technology. The approaches use systems dynamics/systems thinking models, emphasizing cultural awareness, knowledge management, innovation, trust, energy/sustainability. *Capabilities Based Planning* applies Knowledge Value-Added framework (measuring the value of corporate knowledge assets) to Capabilities Based Planning in DoD. The program uses OFT's Network Centric Operations Case Study on SOF actions in Operation Iraqi Freedom as an initial proof-of-concept reference point, to study ROI in DoD. *Case Study on SARS Containment in Singapore* employs Hastily Formed Network technologies to mitigate a national security medical threat. Sponsor partners are OFT, Centers for Disease Control, Office of the Assistant SECDEF/Homeland Defense, & Singapore Ministry of Defense.

Unconventional Weapons of Mass Destruction (UWMD): detailed investigation of novel nuclear physics and its implications. Continue measurements and analyses of novel methods and nuclear effects begun in 2003. This task includes experimental verification and research tracking (isotopic abundance measurements) and documentation of work to date.

Center for Stabilization and Reconstruction Studies. This Center conducts studies to enhance post-conflict recovery for states that have failed or endured calamity and require stabilization and reconstruction. The curriculum is multi-disciplinary and interactive, and incorporates members of humanitarian organizations, civilian government officials, U.S. & foreign military officers, and recovering states. Curriculum includes governance and participation; security; economic and social well being; and justice and reconciliation. The program combines the best of contemporary social science with organizational theory, with practical and applied tools.

Civil-Military Relations in China and Chinese strategy. Research conducted for OSD/NET ASSESSMENT on civilian control of China's military during wartime and on Chinese strategy.

The specific areas are: command and control of the Chinese people's liberation army during wartime by civilian leadership, the future evolution of Chinese strategy, and review of materials related to Chinese strategy.

Center for Edge Power. Initiation and management of a new Center for Edge Power. The center conducts research pertaining to Edge organizations in the context of network-centric warfare. Research conducted in the areas of hypothesis testing of Edge organizations, near-optimizing knowledge and power flows, VDT infrastructure enhancement, and exploring and exploiting intercultural knowledge flows and organizational forms.

Operations Research Support to Personnel and Readiness Office/OSD. This project analyzes the cost and readiness effects from using of alternative types of personnel to operate UAVs, and expanding analysis of alternatives to meeting the missions of operational support aircraft for the U. S. Navy, and USA.

Lessons from Afghanistan -The strategic utility of Special Operations Forces (SOFs). This project examines the institutional and organizational realities that impacted the planning and execution of the war in Afghanistan. The study conducts an in-depth assessment of U.S. unconventional warfare (UW) policy and the development of SOF capabilities for executing UW operations, as well as whether & to what extent UW operations were considered as a policy option.

Distinguished Fellows Program. A program to form partnerships to invest in the intellectual capital of the nation to fight the GWOT. The initial phase (04-05) will fund cooperative research with the University of California at Santa Barbara. Topics: Single Event Stable Finite-State Controllers, Integrated Optical Accumulators Architecture for Use in Sigma Delta ADC, Signal Processing Algorithms for High-Precision Navigation for Underwater Autonomous Sensing, Human Activity Analysis in Video Surveillance.

Technical support to the OSD. This project promotes and supports the development, demonstration and rapid transition of special technologies in response to critical DoD requirements. Also establishes a key interface among DoD, the unified commands and other specific customers.



CFFC *Fleet Forces Command*

FORCEnet Engagement Packs. Sea Trial experimentation with NNWC/CFFC sponsorship: integrate a small set of joint sensors, platforms, weapons, warriors, networks and command and control systems for the purpose of performing cross-mission enabled Combat Reach Capabilities.

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