CALIFORNIA ENERGY COMMISSION

CALIFORNIA NATURAL RESOURCES AGENCY

California Energy Commission

Clean Transportation Program

FINAL PROJECT REPORT

Model and Demonstration of Joint Personal Electric Vehicle and Government Electric Vehicle Charging on Naval Base San Diego

Prepared for: California Energy Commission

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PREFACE

Assembly Bill 118 (Núñez, Chapter 750, Statutes of 2007) created the Clean Transportation Program. The statute authorized the California Energy Commission (CEC) to develop and deploy alternative and renewable fuels and advanced transportation technologies to help attain the state's climate change and clean air goals. Assembly Bill 126 (Reyes, Chapter 319, Statutes of 2023) reauthorized the funding program through July 1, 2035, and focused the program on zero-emission transportation.

The Clean Transportation Program has an annual budget of about $100 million and provides financial support for projects that:

- Develop and deploy zero-emission technology and fuels in the marketplace.
- Produce alternative and renewable low-carbon fuels in California.
- Deploy zero-emission fueling infrastructure, fueling stations, and equipment.
- Establish workforce-training programs and conduct public outreach on the benefits of alternative transportation fuels and vehicle technologies.

To be eligible for funding under the Clean Transportation Program, a project must be consistent with the CEC's annual Clean Transportation Program Investment Plan Update. The electric vehicle charging facility project on Naval Base San Diego was deemed "consistent" with the CEC's annual Clean Transportation Program Investment Plan Update. The CEC issued agreement number ZVI-22-028 to TechFlow which partially funded the construction and installation of Level 2 and Level 3 electric vehicle chargers for dual government owned vehicle and personally owned vehicle use on Naval Base San Diego.

TechFlow is not authorized to share some sensitive information related to this project (i.e., photographs, detailed drawings, single-line diagrams, operating manuals/protocols) due to federal regulations regarding controlled, unclassified information.

ABSTRACT

In 2021, the White House set a nationwide goal to raise new car sales for electric vehicles to 50 percent by 2030. Increasing charging capabilities at over 800 military bases around the country and more than 30 bases in California is therefore needed in response to the increase in government- and personally-owned electric vehicles. The California Energy Commission issued agreement number ZVI-22-028 to TechFlow to augment the number of chargers purchased and installed as a complement to a federally funded effort. California Energy Commission funding under the Clean Transportation Program partially funded the installation of five dual port Level 2 electric vehicle chargers and one dual port Level 3 direct current fast charger at Naval Base San Diego.

Keywords: California Energy Commission, Clean Transportation Program, electric vehicle, zero-emission vehicle, charging, infrastructure, military bases, Naval Base San Diego

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EXECUTIVE SUMMARY

In alignment with federal administration guidance in Executive Order 14008 and 14057, the Department of Defense was preparing to achieve 100% zero-emission non-tactical vehicle acquisitions by 2035 with the appropriate charging or refueling infrastructure. The Office of the Deputy Assistant Secretary of Defense for Energy Resilience and Optimization was providing guidance to ensure electric vehicle chargers are installed at the right time and place to support electrification of over 180,000 non-tactical vehicles at over 500 installations across the United States and globally.

The California Energy Commission (CEC) issued agreement number ZVI-22-028 to TechFlow to augment the number of chargers purchased and installed as a complement to a federally funded effort at Naval Base San Diego. The purpose of the Naval Base San Diego project was to design and build an electric vehicle charging facility prototype to support both government owned vehicles and personally owned vehicles with electric vehicle charging requirements.

The CEC grant facilitated the deployment of charging infrastructure on Naval Base San Diego that directly aligns with California's ambitious climate and clean air goals. By providing military personnel and other users with access to electric vehicle chargers, the charging facility supports the transition from fossil fuel-based vehicles to zero-emission alternatives. This not only helps reduce the carbon footprint of the military installation but also contributes to the state's overarching efforts to combat climate change and improve air quality. The development of this charging facility aligns with both California's zero-emission vehicle goals and federal sustainability directives for military installations.

Given the strategic importance of military installations, ensuring energy resilience is paramount. By investing in charging infrastructure, the CEC and partners are contributing to a more diversified and sustainable energy portfolio. The facility at Naval Base San Diego enables the integration of renewable energy sources (such as solar) and supports the military's mission of energy security. Additionally, the ability to charge electric vehicles on-site provides enhanced readiness in the event of fuel supply disruptions, aligning with the state's priorities for grid reliability and energy independence.

The grant enabled TechFlow to showcase the integration of cutting-edge clean energy technologies within a federal military context. The charging facility is designed to not only serve current needs but also to accommodate future advancements in electric vehicle technology and infrastructure. This includes plans for expanding the number of chargers and integrating smart charging systems that will optimize energy use, further demonstrating California's leadership in technological innovation.

The construction and ongoing operation of the charging facility has also created new employment opportunities for local workers and contractors. Moreover, this project has provided the military and surrounding community with hands-on experience in clean energy infrastructure, helping build a skilled workforce for California's growing clean energy economy. As California continues to push for clean energy solutions, this facility serves as a valuable model for future installations across the state. The ability to offer electric vehicle charging on a military base serves as a model for other federal, state, and private sector entities to follow, ensuring that California remains at the forefront of clean energy adoption and implementation.

CHAPTER 1:
Dual-Use Personally- and Government-Owned Electric Vehicle Charging Prototype Success

Background

In alignment with federal administration guidance in Executive Order 14008 and 14057, the Department of Defense was preparing to achieve 100% zero-emission non-tactical vehicle acquisitions by 2035 with the appropriate charging or refueling infrastructure. The Office of the Deputy Assistant Secretary of Defense for Energy Resilience and Optimization was providing guidance to ensure electric vehicle chargers are installed at the right time and place to support electrification of over 180,000 non-tactical vehicles at over 500 installations across the United States and globally.

The California Energy Commission (CEC) issued agreement number ZVI-22-028 to TechFlow to augment the number of chargers purchased and installed as a complement to a federally funded effort at Naval Base San Diego. The purpose of the Naval Base San Diego project was to design and build an electric vehicle charging facility prototype to support both government owned vehicles and personally owned vehicles with electric vehicle charging requirements.

Charging Facility Prototype and Protocol Development

Facilitated by the Defense Innovation Unit, this project utilized the Other Transaction Authority method under Title 10 U.S.C. §4022, which promoted collaboration and cooperation between the contractor and key stakeholders across multiple government agencies. Title 10 U.S.C. §4022[1] encourages both dual-use and defense-specific projects and authorizes other transactions to acquire prototype capabilities and allow for those prototypes to transition into production other transactions.

Successful prototype other transactions offer a streamlined method for transitioning into follow-on production agreements. At Naval Base San Diego, the Other Transaction Authority method as opposed to a traditional Federal Acquisition Regulation contract, fostered innovative approaches to problem solving, flexibility, faster decision making, and shorter procurement timelines leading to a successful dual-use electric vehicle charging facility prototype.

Furthermore, the future integration of photovoltaic solar panels paired with battery storage will significantly contribute to energy grid resilience by allowing for the storage of excess electricity generated during peak sunlight hours, which can then be released back into the grid during periods of high demand or power outages. The successful electric vehicle charging facility prototype and future technological resiliency advancements will contribute greatly to military installation mission requirements for training and readiness, crisis response, and major combat operations.

The protype at Naval Base San Diego has contributed to advances in science and technology for follow-on production electric vehicle charging facilities at future military sites. This project

[1] Title 10 U.S.C. §4022 provides the Department of Defense (DoD) with authority to carry out "prototype projects" to enhance mission effectiveness or improve platforms, systems, or materials.

will contribute to the burgeoning electric vehicle charging infrastructure across the United States.

Figure 1: Collaboration and Cooperation

San Diego (January 25, 2024) The Assistant Secretary of the Navy for Energy, Installations and Environment, Meredith Berger, attends the bi-annual Department of the Navy and California Energy Commission meeting. Source: U.S. Navy photo by Sergio Hernandez

Dual-Use Charging at Naval Base San Diego

Dual-use personally owned vehicle and government owned vehicle charging is a unique feature of Department of Defense installations. While the core mission of military bases is simply to ensure the readiness of the force to respond to crisis, the quality of life for both uniformed and non-uniformed personnel plays a critical role in morale, retention, and daily functionality. Providing personally owned vehicle charging contributes to workforce well-being while aligning with broader clean transportation goals.

With funding support from the California Energy Commission, Naval Base San Diego enhanced its charging infrastructure by deploying several new Level 2 and Level 3 direct current (DC) fast charging units. These installations strengthen the base's ability to support dual use charging and expand electric vehicle access for its personnel, contributing to a more resilient and sustainable transportation network.

Level 2 chargers are adequate for government owned vehicle users as they can charge overnight. However, military personally owned vehicle owners often have restricted use to military charging stations. The availability of high-power charging, such as DC fast chargers, has become increasingly important to provide military personnel charging support for their personally owned vehicles. The goal of this Agreement was to provide Level 2 and Level 3 DC fast charging for both government owned vehicles and personally owned vehicles on military bases to support California's transition to a zero-emission transportation sector.

CHAPTER 2:
Performance Overview

Charging Technology Deployment

California Energy Commission funding under the Clean Transportation Program partially funded the installation of five dual port Level 2 electric vehicle chargers and one dual port Level 3 direct current fast charger at Naval Base San Diego. The following provides an overview of two major charging technologies supported by CEC funding at the site:

PowerCharge Commercial Energy Series EV Chargers

The PowerCharge Commercial Energy Series is a Level 2 electric vehicle charging solution designed for commercial applications. With multiple configurations, this system offers flexibility for various installation environments, including fleet, workplace, and public access settings.

Key features include:

- High-speed charging delivering up to 35 miles of driving range per hour, up to 10 times faster than standard 110-volt outlets
- Adjustable power output options to match supply panel capacity
- Smart connectivity, including open access, radio frequency identification (RFID) access, and fully networked options with Ethernet, cellular, and Wi-Fi connectivity for remote diagnostics, driver notifications, and usage data reporting
- Outdoor-rated and ADA compliant compact and durable design
- Compliance and certification with key safety and interoperability standards

Tritium PKM150 DC Fast Charger

The Tritium PKM150 is a modular, high-power DC fast charging system optimized for commercial and fleet use. It offers flexible charging capabilities, including support for single vehicle charging at up to 150 kilowatts (kW) or dual vehicle charging at 75 kW each. The system is scalable and can be deployed as a lower kilowatt system and upgraded to 150 kW as demand increases. This charging solution is ideal for scalable, future-proof infrastructure, offering flexibility, high performance, and strong interoperability with EV standards and backend systems.

Key features include:

- Support for both CCS and CHAdeMO charging standard connectors
- User friendly interface equipped with a 10 inch screen, RFID access, integrated credit card reader, and connectivity via Ethernet or 3G/4G networks
- Rugged construction with a wide operating temperature range (-35°C to +50°C)
- Modular design with field-replaceable components and single-person lift capabilities, reducing maintenance time and cost

Charger Performance

In July 2024, TechFlow successfully tested and commissioned all CEC funded electric vehicle chargers. Subsequently, in coordination with Naval Base San Diego, the Defense Innovation Unit issued TechFlow an electric vehicle charge facility prototype success memo confirming government-owned vehicle and personally-owned vehicle users can access chargers 24 hours a day, 7 days a week and that the Naval Base San Diego power grid was upgraded with additional transformers and switchboards to allow the high-power requirements of the Level 3 DC chargers.

Figure 2: Electric Vehicle Charging Facility at Naval Base San Diego

Electric vehicle charging facility consisting of Level 2 and DC fast chargers, panelboard, transformers, switchgear, and rectifier unit. Source: *TechFlow, Inc.*

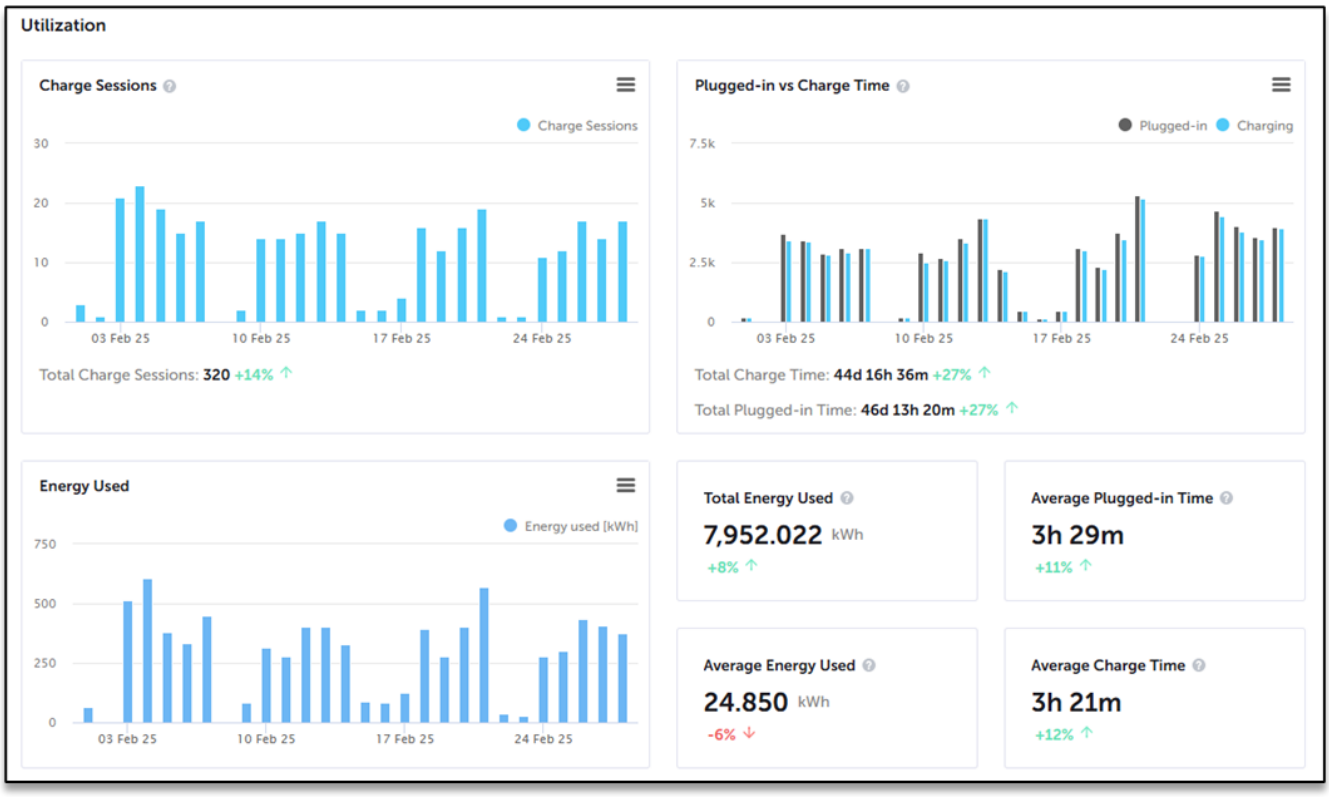
During the seven-month reporting period (from August 1, 2024, to February 28, 2025), EV chargers at Department of Defense installations supported 1,780 charging sessions, delivering over 45,000 kilowatt-hours (kWh) of energy. This resulted in estimated savings of more than 29,500 kilograms of GHG emissions and 3,320 gallons of gasoline, while maintaining an exceptional 99.8 percent service uptime as summarized in Table 1. These outcomes reflect not only the environmental benefits of electrifying non-tactical vehicle fleets, but also the operational reliability of charging systems in supporting daily mission requirements.

Table 1: Charger Data and Estimated Benefits

Total Charging Sessions	Energy Provided (kWh)	GHG Emissions Savings (kg)	Gas Savings (gallons)	Service Uptime
1,780	45,120	29,526	3,320	99.8%

Charging session data and estimated benefits from time period of August 1, 2024, to February 28, 2025. Source: TechFlow Dashboard

Figure 3: Snapshot of Charger Utilization Data in February 2025



Source: TechFlow Dashboard

The dashboard snapshot (Figure 3) provides a real time view of charger performance during February 2025, including session counts, energy delivery, and uptime metrics. While Table 1 summarizes cumulative historical data across seven months, the dashboard visualization illustrates how performance is monitored and reported in near real time, reinforcing the reliability and consistency of operations.

CHAPTER 3:
Project Impact

Project Impact to Department of Defense

The implementation of electric vehicle charging infrastructure directly supports the Department of Defense's mid-range operational objectives and long-term strategic vision. This vision includes increasing energy resilience, reducing dependence on fossil fuels, and aligning with federal clean energy and climate priorities. Non-tactical vehicles play a critical role in meeting service-level requirements for training and readiness, and transitioning this fleet to electric enhances operational efficiency and sustainability. At the operational level, fuel cost savings can be redirected to support tactical and forward-deployed unit needs, optimizing resource allocation. Strategically, the ability to rapidly field and scale innovative electric vehicle charging technologies strengthens logistical flexibility, enhances installation energy security, and positions the Department of Defense as a leader in technological modernization in all mission critical components of national defense strategy.

Resiliency

The Department of Defense's primary objective is to increase the resilience of our installations to protect against natural and man-made disruptions. Our efforts to reduce greenhouse gas (GHG) emissions help advance that objective[2] and include:

- Reducing the Department of Defense's dependence on offsite energy sources by emphasizing on-site clean energy generation and storage, increasing efficiency measures, and incorporating clean energy-powered microgrids that enable resilience and reduce GHG emissions
- Leveraging available data to inform decisions and measure progress
- Identifying opportunities via the expertise of Department of Defense's energy managers and master planners
- Leveraging all sources of funding, including third-party financing and appropriated funds, to rapidly deploy proven technologies

Environmental and Economic Benefits of Electric Vehicle Chargers on Military Installations

Electric vehicle (EV) chargers support environmental goals by reducing emissions and pollution, while also benefiting the economy by reducing operating costs, creating jobs, and stimulating innovation. The shift to EVs and the expansion of charging infrastructure are key steps toward a more sustainable future. EV chargers are beneficial to both the environment and the economy for several reasons, including reduced pollution, increased energy efficiency, consumer cost savings, energy independence, and job creation.

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1 U.S. Department of Defense. April 2023. Department of Defense Plan to Reduce Greenhouse Gas Emissions, https://media.defense.gov/2023/Jun/16/2003243454/-1/-1/1/2023-DOD-PLAN-TO-REDUCE-GREENHOUSE-GAS-EMISSIONS.PDF.

EVs and associated charging infrastructure provide environmental benefits related to reduced greenhouse gas emissions, cleaner air, reduction in noise pollution, and energy efficiency as summarized below:

- When EVs are charged using clean energy sources (like solar, wind, or hydroelectric power), they produce zero emissions during operation, reducing overall greenhouse gas emissions.
- Even if the electricity is generated from fossil fuels, EVs are still generally more efficient and produce fewer emissions than traditional gasoline or diesel vehicles.
- EVs do not emit tailpipe pollutants like nitrogen oxides (NOx) or particulate matter, which contribute to air pollution and related health problems like asthma and heart disease. This is especially important in urban areas with high traffic and pollution.
- EVs are much quieter than internal combustion engine vehicles, contributing to less noise pollution, especially in cities where traffic noise can be a major disturbance.
- EVs are more energy-efficient compared to traditional cars because electric motors are inherently more efficient than combustion engines, leading to less energy consumption overall.

EVs and associated charging infrastructure also provide economic benefits related to cost savings for consumers, job creation, energy independence, and economic growth through innovation as summarized below:

- EVs are cheaper to maintain because they have fewer moving parts than traditional vehicles. They don't require oil changes, and they experience less wear and tear on components like brakes due to regenerative braking.
- Charging an EV is generally cheaper than fueling a traditional car, especially with increasing availability of home charging and public charging stations. This can lead to savings for consumers over the life of the vehicle.
- The rise of EV chargers and the EV industry in general creates new jobs in manufacturing, installation, and maintenance. This can stimulate local economies and help diversify the job market.
- Charging EVs with domestically produced energy sources helps reduce dependence on foreign oil. This can improve energy security and stabilize energy prices in the long term.
- The growing demand for electric vehicles has spurred innovation in renewable energy, battery technologies, and charging infrastructure. This fosters economic growth by attracting investments, advancing technological capabilities, and supporting new businesses in clean tech.

Conclusion

The CEC grant facilitated the deployment of charging infrastructure on Naval Base San Diego that directly aligns with California's ambitious climate and clean air goals. By providing military personnel and other users with access to electric vehicle chargers, the charging facility supports the transition from fossil fuel-based vehicles to zero-emission alternatives. This not only helps reduce the carbon footprint of the military installation but also contributes to the

state’s overarching efforts to combat climate change and improve air quality. The development of this charging facility aligns with both California's zero-emission vehicle goals and federal sustainability directives for military installations.

Given the strategic importance of military installations, ensuring energy resilience is paramount. By investing in charging infrastructure, the CEC and partners are contributing to a more diversified and sustainable energy portfolio. The facility at Naval Base San Diego enables the integration of renewable energy sources (such as solar) and supports the military’s mission of energy security. Additionally, the ability to charge electric vehicles on-site provides enhanced readiness in the event of fuel supply disruptions, aligning with the state’s priorities for grid reliability and energy independence.

The grant enabled TechFlow to showcase the integration of cutting-edge clean energy technologies within a federal military context. The charging facility is designed to not only serve current needs but also to accommodate future advancements in electric vehicle technology and infrastructure. This includes plans for expanding the number of chargers and integrating smart charging systems that will optimize energy use, further demonstrating California’s leadership in technological innovation.

The construction and ongoing operation of the charging facility has also created new employment opportunities for local workers and contractors. Moreover, this project has provided the military and surrounding community with hands-on experience in clean energy infrastructure, helping build a skilled workforce for California's growing clean energy economy.

As California continues to push for clean energy solutions, this facility serves as a valuable model for future installations across the state. The ability to offer electric vehicle charging on a military base serves as a model for other federal, state, and private sector entities to follow, ensuring that California remains at the forefront of clean energy adoption and implementation.

GLOSSARY

CALIFORNIA ENERGY COMMISSION (CEC)—The state agency established by the Warren-Alquist State Energy Resources Conservation and Development Act in 1974 (Public Resources Code, Sections 25000 et seq.) responsible for energy policy. The Energy Commission's five major areas of responsibilities are:

1. Forecasting future statewide energy needs.
2. Licensing power plants sufficient to meet those needs.
3. Promoting energy conservation and efficiency measures.
4. Developing renewable and alternative energy resources, including providing assistance to develop clean transportation fuels.
5. Planning for and directing state response to energy emergencies.

CHARGER—A device with one or more charging ports and connectors for charging electric vehicles. Also referred to as electric vehicle supply equipment (EVSE).

DIRECT CURRENT (DC)—Electricity that flows continuously in the same direction.

DIRECT CURRENT FAST CHARGER (DCFC)—A charger that enables rapid charging by delivering direct current (DC) electricity directly to an electric vehicle's battery also known as level 3 charger.

ELECTRIC VEHICLE (EV)—A vehicle that is either partially or fully powered by electricity or an electric motor. Examples include battery-electric vehicles, plug-in hybrid electric vehicles, and fuel cell electric vehicles.

GREENHOUSE GAS (GHG)—Any gas that absorb infra-red radiation in the atmosphere. Greenhouse gases include water vapor, carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), halogenated fluorocarbons (HCFCs), ozone (O3), perfluorinated carbons (PFCs), and hydrofluorocarbons (HFCs).

INTERNAL COMBUSTION ENGINE (ICE)—An engine in which fuel is burned inside the engine. A car's gasoline engine or rotary engine is an example of an internal combustion engine. It differs from engines having an external furnace, such as a steam engine.

KILOWATT (kW)—One thousand (1,000) watts. A unit of measure of the amount of electricity needed to operate given equipment.

KILOWATT-HOUR (kWh)—The most commonly used unit of measure telling the amount of electricity consumed over time. It means one kilowatt of electricity supplied for one hour.

LEVEL 2 CHARGER—A charger that operates on a circuit from 208 volts to 240 volts and transfers AC electricity to a device in an electric vehicle that converts AC to direct current to charge an EV battery.

NITROGEN OXIDES (NOX)—A general term pertaining to compounds of nitric oxide (NO), nitrogen dioxide (NO2) and other oxides of nitrogen. Nitrogen oxides are typically created during combustion processes and are major contributors to smog formation and acid deposition. NO2 is a criteria air pollutant and may result in numerous adverse health effects.

NON-TACTICAL VEHICLES—Government owned or leased, commercially designed vehicles used for routine administrative, logistical, or support functions, rather than direct combat or tactical operations.

OTHER TRANSACTION AUTHORITY (OTA)—A flexible, non-contractual legal instrument that allows government agencies to engage in research, prototype, and production, often bypassing the Federal Acquisition Regulation to expedite the acquisition of new technologies, promote non-traditional vendors, and incorporate commercial best practices.

RADIO FREQUENCY IDENTIFICATION (RFID)—A wireless communication technology that uses radio waves to identify and track objects by reading data from electronic tags without direct physical contact or a line of sight.