



Secretary of the Navy Launches Great Green Fleet

Year-long Initiative Kicks Off in San Diego

ON JANUARY 20, ships from the USS John C. Stennis Carrier Strike Group sailed out of Naval Air Station (NAS) North Island, San Diego on alternative fuel—the carrier itself traveling on nuclear power as usual, and vessels from the strike group on an advanced biofuel blend. The ships and aircraft will also use energy efficient technologies and/or practices during this deployment. The event was the official launch of the Great Green Fleet—the second half of a key energy goal established by Secretary of the Navy (SECNAV) Ray Mabus back in 2009.

Guided-missile destroyer USS Stockdale (DDG 106) and the aircraft carrier USS John C. Stennis (CVN 74) served as the backdrop for the kickoff ceremony, where Secretary Mabus delivered remarks alongside U.S. Department of Agriculture (USDA) Secretary Tom Vilsack; Vice Adm. Mike Shoemaker, Commander, Naval Air Forces, Pacific;

Congresswoman Susan Davis (D-CA) and Congressman Scott Peters (D-CA). Deputy Under Secretary of the Navy Tom Hicks; Assistant Secretary of the Navy (Energy, Installations and Environment) Dennis McGinn; and Deputy Assistant Secretary of the Navy (Energy) Joe Bryan also attended the ceremony.

Secretary Mabus reflected on the progression of energy sources throughout U.S. naval history during his remarks. “The Navy has always been a leader when it comes to energy innovation,” said Mabus. “From sail to coal in the middle of the 19th century, from coal to oil in the early 20th century, to pioneering the use of nuclear in the middle of the 21th century.”

Mabus related this history of energy advances to the operating environment of naval forces. “Sailors look out, they look to the horizon. They see no obstacles. They see the open sea,” he said.

As the U.S. ambassador to Saudi Arabia from 1994–1996, Mabus had noted with concern that the U.S. military is highly dependent on foreign oil. Upon assuming his position as Secretary of the Navy in 2009, he sought to reduce that dependence by diversifying energy sources and lowering energy consumption across the Department.

“When it comes to power, my focus has been about one thing and one thing only—better warfighting,” Mabus remarked. “The Great Green Fleet shows how we are transforming our energy use to make us better warfighters, to go farther, stay longer and deliver more firepower. In short, to enable us to provide the global presence that is our mission.”

Secretary Vilsack stated that the feedstock for the biofuel to be used during this most recent launch of the Great Green Fleet was provided by Midwestern farmers and ranchers,

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—Secretary of the Navy Ray Mabus



supporting rural America and the nation's agricultural economy.

"Today's deployment proves that America is on its way to a secure, clean energy future, where both defense and commercial transportation can be fueled by our own hard-working farmers and ranchers, reduce landfill waste, and bring manufacturing jobs back to rural America," said Vilsack. He pointed out that rural America comprises 15 percent of the nation's population, yet nearly 40 percent of armed service members originate from this region.

Technologies & Energy-related Programs on Display

Just a few yards from the ceremonial stage, exhibits on the NAS North Island pier showcased energy projects and systems that are in use within the Navy and Marine Corps and which support the SECNAV's energy goals. Event participants and reporters toured the exhibits and asked questions about the technologies.

The Navy Expeditionary Combat Command set up tents with energy-efficient linings, a high-efficiency generator, and light emitting diode

(LED) lighting, and also offered tours of a global positioning system-assisted bulldozer that reduces time and fuel expended for grading functions in the field. The Chief of Naval Operations Energy and Environmental Readiness Division (OPNAV N45) display showed samples of algae, camelina, and animal fat-based biofuels; the Energy Warrior app and video content; and a tabletop solar charging station.

The U.S. Fleet Forces Command display featured information about shipboard and aviation energy conservation measures, as well as an interac-

The Basics About Secretary of the Navy Ray Mabus

THE HONORABLE RAY Mabus is the longest serving Secretary of the Navy since World War I. Secretary Mabus announced his vision for the Great Green Fleet in 2009 as one of five aggressive energy goals:

- 1. Increase Alternative Energy Use Department of the Navy (DoN)-Wide**
By 2020, 50 percent of total energy consumption will come from alternative sources.
- 2. Increase Alternative Energy Ashore**
By 2020, DoN will produce at least 50 percent of shore-based energy requirements from alternative sources; 50 percent of Navy and Marine Corps installations will be net-zero.
- 3. Sail the "Great Green Fleet"**
DoN will demonstrate a Green Strike Group in local operations by 2012 and sail it by 2016.
- 4. Reduce Non-Tactical Petroleum Use**
By 2015, DoN will reduce petroleum use in the commercial fleet by 50 percent.
- 5. Energy Efficient Acquisition**
Evaluation of energy factors will be mandatory when awarding DoN contracts for systems and buildings.

Secretary Mabus selected the name "Great Green Fleet" as homage to President Theodore Roosevelt's Great White Fleet, which positioned the United States as a global force at the turn of the 20th century. The Great Green Fleet will usher in the next era of DoN energy innovation.

During his tenure, Secretary Mabus has emphasized four priorities to enable the Navy's global posture—People, Platforms, Power and Partnerships, in addition to his energy goals which fall under the Power priority but also enable the other three. Under his leadership, the Navy has reduced oil consumption by 15 percent and the Marine Corps has reduced its use of petroleum by 60 percent since 2009. Ashore, the Navy successfully procured 1.1 gigawatts of renewable energy for its shore facilities, five years earlier than its intended target.





Aviation Energy Operational Procedures

NAVAL AIRCRAFT ARE not presently equipped with new technologies to conserve fuel, but there are numerous procedures and best practices at the disposal of pilots and aircrews that can optimize fuel use and extend flying time.

- Short Cycle Mission and Recovery Tanking which can save fuel burned by aircraft tankers during refueling missions
- Flying based on maximum range profile
- Truck refueling for fixed-wing aircraft training
- Optimum climb and continuous descent flight profile
- Less than all-engine taxi
- Minimizing auxiliary power unit use

The naval aviation community is also revising mission tracking software and data logging approaches to better capture fuel use. In addition, all naval aircraft have been certified to use advanced fuel blends of up to 50 percent biofuel when those fuels are available.



Vice Adm. Mike Shoemaker (left), USDA Secretary Tom Vilsack (center), and SECNAV Ray Mabus (right) stand for the national anthem at the commencement of the Great Green Fleet launch.

Madeline Joyce

tive kiosk and print handouts explaining their “Stewards of the Sea” outreach program.

The Navy Region Southwest exhibit focused on energy-related shore installation management activities at Naval Base Coronado, Naval Base San Diego, Naval Air Station Lemoore, and elsewhere within the region.

Representatives from the Army and the Marine Corps Expeditionary Energy Office (E2O) demonstrated field-portable GREENS and SPACES solar power systems as well as the Joint Infantry Company Prototype (JIC-P)—a kinetic energy harvesting system consisting of a backpack and knee brace for dismounted troops.

Biofuel At Sea Replenishment of USS William P. Lawrence

Following the official remarks and a brief media availability with reporters on the pier, Mabus and Vilsack boarded an MH-60S Seahawk helicopter from Helicopter Sea Combat Squadron (HSC) 14 and flew out to USS William P. Lawrence (DDG 110) at sea to witness the underway replenishment of the Lawrence with a biofuel blend by replenishment oiler USNS Guadalupe (T-AO 200). The Secretaries also toured energy conservation measures aboard the destroyer, which include LED lighting, a stern flap, and a shipboard energy dashboard.

USS William P. Lawrence commanding officer Cdr. Walter C. Mainor underscored the benefit of these initiatives, stating, “As a whole, these energy saving measures allow us to be on station longer and to do our job better. The Navy has been at the forefront of energy innovation.”

The surface combatant ships which received biofuel in the kickoff event timeframe included USS William P. Lawrence, USS Stockdale, USS Coronado (LCS 4) and USS Mobile Bay (CG 53). The biofuel was a drop-in replacement blend of 10 percent fuel derived from waste beef fat and 90 percent conventional marine diesel fuel (F-76).

Navy Requirements & Cost-Competitive Biofuel

To meet the Navy’s requirements, alternative fuels must meet all military fuel specifications and function as drop-in replacements. That means the fuels can be mixed in the same tank as petroleum-based fuels, and do not require modifications to existing engines or transport and delivery systems. Feedstocks for the alternative fuels tested and used by the Navy to date have included algae, camelina (a



relative of the mustard seed), animal fat, and renewable isobutanol. These types of feedstocks are advantageous because they do not compete with food crops.

By law and current policy directives, the Defense Logistics Agency (DLA) and the Navy can only purchase operational quantities of advanced biofuels if they are cost competitive with petroleum-based fuel. In 2015, DLA awarded a contract for 77.6 million gallons of an advanced biofuel blend derived from waste beef fat (10 percent) and conventional petroleum (90 percent) under its Rocky Mountain West Coast bulk fuel solicitation. This is one of four major fuel solicitations DLA uses to supply the Navy with fuel worldwide annually. DLA awarded the contract to California-based producer Alt Air Fuels at the price of \$2.05 per gallon for the fuel blend. Through the Commodity Credit Corporation, USDA contributed approximately \$0.14 per gallon, helping to reach the \$2.05 price and supporting the Midwest farmers and ranchers who supplied the beef fat feedstock. This price is comparable to the price of conventional F-76 fuel.

Shipboard Energy Conservation Measures

During 2016 and beyond, U.S. Navy ships will use energy conservation measures (ECM) to optimize their energy use and get the maximum mission capability out of every

gallon of fuel. ECM technologies currently in use on some Navy ships include the following:

- **Solid State Lighting**
LEDs consume approximately half the energy and last five times longer compared to conventional bulbs.
- **Stern Flaps**
An extension that modifies the water flow under a ship's hull, reducing drag and yielding greater fuel efficiency.
- **Shipboard Energy Dashboard**
A system that provides real-time situational awareness of energy supply and demand.
- **Thermal Management Control System**
Smart programmable thermostats and a centralized control unit provide efficient heating and cooling for each individual compartment throughout a ship.
- **Propeller/Hull Coating**
Spray-on surface that reduces corrosion and accumulation of biofouling organisms that create drag.
- **Combustion Trim Loop**
Electronic controls which optimize fuel/air mixture to improve boiler efficiency and reduce fuel consumption.



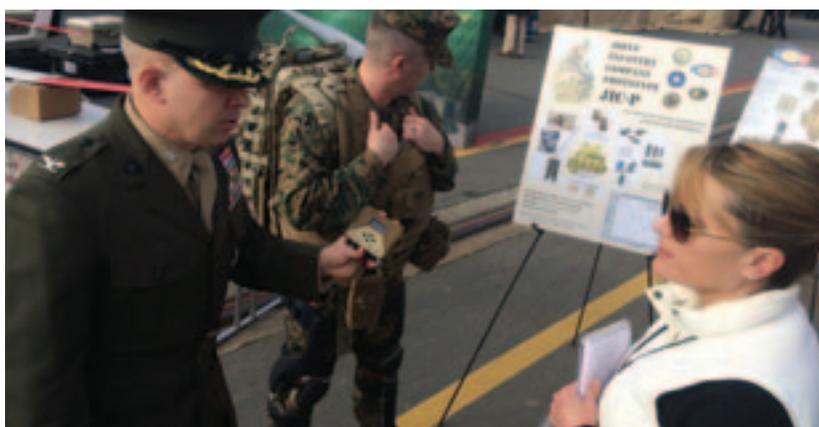
Capt. Brian Weiss from the Fleet Readiness and Logistics (OPNAV N4) Reserve Unit, poses for a photograph with samples of advanced biofuels.

Madeline Joyce



USDA Secretary Tom Vilsack and SECNAV Ray Mabus field questions from reporters at the conclusion of the Great Green Fleet launch ceremony.

Kenneth Hess



Col. Jim Caley, Director of the Marine Corps E2O explains Marine Corps expeditionary systems to reporter Jeanette Steele, San Diego Union-Tribune while Capt. Anthony Ripley demonstrates the JIC-P in the background.

Kenneth Hess



SECNAV Ray Mabus and USDA Secretary Tom Vilsack speak to media aboard the guided-missile destroyer USS William P. Lawrence. Mabus and Vilsack flew out to William P. Lawrence to witness it replenishing its tanks with alternative fuel, made from waste beef fat, from the fleet replenishment oiler USNS Guadalupe.

MCS2 Armando Gonzales

During the launch of the Great Green Fleet 2016, Navy and Marine Corps representatives fielded questions from the press and event participants, and posed for photos for national and local media outlets. Media coverage ranged from local San Diego television and print outlets to national outlet coverage by the Associated Press and Reuters.

Navy ships also use operational procedures to conserve fuel:

- **Trail Shaft**
One of two propeller shafts spinning without power, with the pitch set to minimize drag.
- **Autopilot**
Used during transits to efficiently adjust for weather, sea state, currents and other factors.
- **Minimize Use of Bleed Air System**
Hot air flow from gas turbines can be used for functions such as de-icing and noise reduction, but this affects fuel economy.
- **Drift Operations**
Securing ship engine propulsion and taking advantage of ocean currents to move through the water.
- **Duty Radar Power Reduction**
When two or more Aegis radar-equipped ships are operating in the same area, one ship can sometimes operate in low power or standby mode.
- **Low Power SPY Radar Operation**
Operating SPY radar at low power when tactically prudent.

In addition, Sailors receive training on best practices for conserving energy aboard ships, such as using efficient power plant configurations (“lineups”), turning off unnecessary shipboard equipment, maintaining air conditioning boundaries, and taking short “Navy” showers to conserve water.



Rim of the Pacific 2012

AS THE FIRST part of SECNAV's Great Green Fleet goal, the Navy conducted a biofuel demonstration during the Rim of the Pacific (RIMPAC) exercise on July 19-20, 2012. Ships and aircraft training with Carrier Strike Group 11 operated on 50/50 blends of advanced biofuel derived from cooking oil and algae, along with petroleum-based fuel. They also showcased energy efficient technologies and practices. Participating ships and aircraft in the demonstration included:

- USS Chafee (DDG 90)
- USS Chung Hoon (DDG 93)
- USS Princeton (CG 59)
- USNS Henry J Kaiser (T-AO 187)
- Carrier Air Wing ELEVEN

In contrast, the Great Green Fleet launch in January 2016 included a biofuel blend for surface ships but only conventional fuel for the aircraft. Additional fuel purchases this year may include biofuel for ships and aircraft, depending on cost and availability.

For more information on RIMPAC 2012, see the fall 2012 issue of *Currents* at <http://greenfleet.dodlive.mil/currents-magazine/currents-magazine-2012/currents-fall-2012>.



SECNAV Ray Mabus receives a fuel sample of alternative fuel from Gas Turbine Systems Technician (Mechanical) 3rd Class Shalen Shivers while aboard the guided-missile destroyer USS William P. Lawrence.

MCS2 Armando Gonzales

After the Event

After the event, Mr. McGinn noted the significance of the Great Green Fleet deployment and its implications for future operations. "The launch of the Great Green Fleet marks a milestone for Navy and Marine Corps and sets a "new normal" for leveraging energy in our daily operations. The incorporation of energy efficient technologies and practices, and alternative fuels into our missions is a significant step toward increasing combat capability, enhancing operational flexibility, and eliminating vulnerabilities for our Sailors and Marines," said McGinn.

Throughout 2016, other DoN ships, aircraft, amphibious and expeditionary forces, and shore facilities will highlight energy efficient technologies and practices, as well as alternative fuel use, as part of the Great Green Fleet as they perform their planned missions worldwide. ⚓

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