



WORLD NAVIES

IN REVIEW By Eric Wertheim

THE PAST YEAR saw continued political upheaval across the globe as alliances shifted and the world appeared less predictable. Defense budgets are expanding as a result, and many nations hope that naval power will afford them security in an increasingly insecure world.

This review of the world's navies presents snapshots of activities and developments during the past year. It is arranged by region, with nations discussed alphabetically under each subheading.

AUSTRALIA/ASIA

Australia released its latest defense white paper and long-range investment plan in February 2016. The document confirms plans to replace the six

Collins-class submarines with a force of 12 "regionally superior" non-nuclear-powered boats. Construction on the new class, based on the French Barracuda design, is to begin in Australia around 2023, with the first units expected to enter service in the early 2030s. The *Collins* submarines are to begin receiving sonar enhancements and other improvements in the 2020s to keep them fully capable until their replacements arrive.

The first of Australia's three Aegis-equipped *Hobart*-class air warfare destroyers began sea trials in 2016 and will be commissioned in mid-2017. A second unit is due for delivery in 2018, while the third and final destroyer of the class will be handed over in 2020. Nine antisubmarine-warfare-focused frigates are set to begin joining the fleet in the late 2020s to replace the ANZAC class, all of which are being upgraded with new antiship missile defenses through late 2017. Construction of a dozen new 1,800-ton offshore patrol vessels is expected to begin in 2018, replacing the current *Armidale* class, while deliveries of 19 131-foot Pacific patrol boat replacements are set to begin in 2018. Two new 19,500-ton replenishment oilers based on the Spanish *Cantabria* class have been or-



In December, China deployed its aircraft carrier *Liaoning* into the South China Sea with a strike group.

China's fifth 7,500-ton Luyang III-class (Project 052D) guided-missile destroyer entered service in January 2017 as older ships, such as its last remaining Luda-class (Project 051) destroyer, were retired. Unconfirmed reports indicate construction of the first Project 055 destroyer has begun, with delivery expected in 2018. In December 2016, China commissioned its 23rd Jiangkai II-class (Project 054A) guided-missile frigate, and a large number of guided-missile corvettes also are joining the fleet. By January 2017 the Navy's 41st 1,500-ton Jiangdao (Project 056) corvette was launched and its 31st Project 056 entered service. China's fourth Yuzhao-class (Project 071) amphibious dock landing ship entered service in early 2016, and as many as eight may eventually be commissioned. A new Project 726 air cushion landing craft also is under construction. The Chinese auxiliary fleet is expanding in size and capabilities as well, and the new space event/tracking ship *Yungwang-7* entered service in 2016, along with two new 20,000-ton Fuchi-class replenishment vessels (Project 093A).

China's Coast Guard fleet continues to expand both in size and vessel displacement. In 2016 construction finished on its second large 12,000-ton cutter, while new medium cutters were being built with hull designs that appear similar to the Jiangkai II-class frigates.

dered for delivery by 2020, to replace the *Success* and *Sirius*.

Australia's 24th and final MH-60R Seahawk helicopter was delivered in mid-2016, and 15 P-8A Poseidon long-range maritime patrol aircraft are on order for delivery in the 2020s. Acquisition of new MQ-4C Triton unmanned aerial vehicles (UAVs) is planned to begin in the early 2020s.

Azerbaijan is working to enhance its Caspian Sea capabilities and held a number of naval exercises in 2016. New patrol craft and boats are entering service, and reports indicate at least some of the country's naval assets are being equipped with Israeli-built

Australia plans to begin operating MQ-4C Triton UAVs in the early 2020s.

Spike non-line-of-sight (NLOS) missiles, adding antiship capabilities.

Bangladesh accepted two refurbished Ming-class (Project 035) submarines from China this past year, along with two new Chinese 1,500-ton C-13B corvettes. In August, the Bangladeshi Coast Guard took delivery of its first two refurbished *Minerva*-class corvettes transferred from Italy. These will be joined by two sister ships in 2017.



ROYAL AUSTRALIAN AIR FORCE

In early 2016 the U.S. Department of Defense estimated the Chinese submarine force included 53 diesel boats, 5 nuclear-powered attack submarines (SSNs), and 4 nuclear-powered ballistic missile submarines (SSBNs) and was expected to grow to between 69 and 78 total submarines by 2020. Four Jin-class (Project 094) SSBNs were operational and up to five are planned, while two Shang-class (Project 093) SSNs were active by 2016, with six believed planned for service. In mid-2016 a new modified variant of the Project 094 SSBN, thought to be the fourth unit of the class, was sighted, and similarly modified variants of the Project 093 SSNs have been sighted as well, each with what appears to be new features for improved hydrodynamic performance. A new class of Project 095 SSNs is expected, along with a new class of Project 096 SSBNs, beginning in the mid-2020s.

In December, China deployed its sole aircraft carrier, the *Liaoning*, into the South China Sea for flight operations and training with a strike group of three destroyers, two frigates, a corvette, and an oiler. The country's first domestically built aircraft carrier, reportedly named the *Shandong*, appears similar to the *Liaoning* and is expected to be launched in 2017 for service entry around 2020. A third planned carrier likely will be built to a new design featuring full catapult capabilities, possibly to include an Electromagnetic Aircraft Launch System.

India agreed to accept three incomplete *Admiral Grigoryevich* (Project 11356M)-class frigates from Russia in late 2016, to be completed for service with the Indian fleet. The warships, near sisters of the *Talwar*-class, are powered by Ukrainian gas-turbine engines, which no longer are exportable to Russia. India's third and final *Kolkata*-class (Project 15A) destroyer entered service in November of last year, and in September the second of four planned *Visakhapatnam*-class (Project 15B) destroyers was launched. The first of four 320-ton follow-on waterjet fast attack craft, based on the *Car Nicobar*



India has ordered 45 MiG-29K naval fighters from Russia and 12 P-8A maritime patrol aircraft from the United States.

HARTMUT EHLERS

class, joined the fleet in 2016, and the first of a new class of eight 206-foot utility landing craft also began entering service this past fall. A new class of seven 398-foot next-generation missile and helicopter-carrying corvettes are expected to begin entering the fleet in the mid-2020s.

This past May, India canceled plans to order 98 Black Shark torpedoes because of corruption allegations. The heavyweight torpedoes were to have armed six new 1,600-ton *Scorpène*-class diesel submarines, the first of which, the *Kalvari*, began sea trials last year. All six of the new boats are due for delivery by 2021. In summer 2016 India announced plans to upgrade two of its Type 209/1500-class submarines to extend their service lives and capabilities. It also plans to lease a second Akula-class SSN from Russia beginning in the early 2020s, though details and financing still are being negotiated. India's first nuclear-powered ballistic missile submarine, the *Arihant*, continued sea trials in 2016. Construction of a second unit has begun, with up to five possible by 2030.

India's 45,000-ton Russian-built aircraft carrier *Vikramaditya* entered service in 2014, but several problems have kept her from achieving full operational capability. India's 55+ year-old aircraft carrier *Viraat* was laid up in 2016 in advance of her planned decommissioning

this year. Construction of a new 40,000-ton domestically built aircraft carrier, the *Vikrant*, continues to suffer delays. Delivery may take place in 2019, but incomplete aviation systems could push full operational capability to around 2023. An even larger 65,000-ton aircraft carrier also is planned for service in the 2030s, with construction expected to begin in the early 2020s. The last of 45 carrier-based MiG-29K fighters are due for delivery from Russia in 2017, but quality-control and defect problems reportedly keep reliability rates for the aircraft well below 40 percent.

In March 2016, India officially retired all remaining FRS.51 Sea Harrier vertical/short takeoff and landing (V/STOL) fighter aircraft. It recently ordered additional P-8A maritime patrol aircraft from the United States, and 12 aircraft are now expected for delivery by 2021. Twelve additional Do-228 maritime patrol aircraft were ordered this past year as well. The country also is investing in unmanned technology and appears likely to order 22 Guardian maritime UAVs from the United States in the near future. Testing of India's long-delayed domestically designed Light Combat Aircraft-Naval (LCA[N]) project continues, and service entry for the aircraft is planned for the early 2020s.

Indonesia has been making efforts to strengthen its naval capabilities in

the South China Sea, particularly off the Natuna Islands. In early 2016, the first of two planned 2,400-ton Sigma 10514-class corvettes was launched, and both units are expected for delivery by the end of 2017. The fourth 141-foot PC-43-class craft entered service in mid-2016, and a new PC-40 class is to begin entering service in 2017.

The first of three German-designed Type 209/1400 submarines was launched in March 2016 for delivery in 2017. Two units are being built in South Korea, while the third and final boat will be built in Indonesia. Acquisition of Kilo-class submarines from Russia also reportedly is under consideration, for service in the 2020s.

Japan has been shoring up its defensive capabilities while taking a more active role in the Asia-Pacific region. This has included development of a 2,000-person marine corps based on the U.S. model. New AAV7 amphibious assault vehicles were ordered in 2016, along with additional V-22 Ospreys.

The second 24,000-ton *Izumo*-class helicopter-carrying destroyer, the *Kaga*, will be able to accommodate more than two dozen rotary-wing aircraft when commissioned into service next year. The first of two new 5,100-ton Type 25DD antisubmarine destroyers was launched in October 2016, and both are planned for service by the mid-2020s. Two larger Type 27DD Aegis-equipped air-defense destroyers, known as the Improved *Atago* class, are expected to be launched in the early 2020s.

New coast guard ships are being built for service around the waters of contested islands, and new longer range coastal defense cruise missiles are planned to provide better island defense from extended distances. The Navy also is expanding its ballistic missile defense (BMD) capabilities through international cooperation and has requested procurement of new SM-3 Block IIA missiles.

Twelve *Soryu*-class air-independent propulsion (AIP)-capable submarines are planned for service. The sixth unit entered the fleet in 2016; commissioning of a seventh is planned for 2017.

Roughly a dozen new P-1 maritime patrol aircraft had been delivered by early 2017, and a total of 65 are planned.

Japan also is acquiring at least four new E-2D Advanced Hawkeye early warning and control aircraft, with deliveries set to begin in 2018.

Kazakhstan's fifth Sardar-class (Project 22180) coast guard patrol craft was launched this past April, and a sixth unit is due for delivery by late 2018. Future acquisition plans include three Russian Project 21632 corvettes, based on the 900-ton Buyan-M class, and new fast interceptor craft.

Malaysia plans to build six new 3,000-ton Second Generation Patrol Vessels based on the French Gowind 2500 design, with deliveries expected to begin by 2019. The new stealthy warships will carry a helicopter and antiship and antiair missiles and are intended for littoral and coastal patrol operations.

The **Maldives** hosted an Indian Druv naval helicopter this past year to assist with coastal patrol duties. Once the mission was completed, the helicopter was turned over permanently to the Maldives' defense force.

Myanmar's new domestically built guided-missile corvette, the *Tabinshwehti*, entered service this past December. Six new 95-foot medium landing craft also recently joined the fleet, along with a 253-foot former civilian passenger transport ferry converted for service as a troop transport.

New Zealand plans to retire the replenishment and support vessel *Endeavour* in 2018 and replace her with a new 24,000-ton South Korean-built ice-strengthened logistics support ship by 2020. This past November the United States and New Zealand put decades of nuclear controversy behind them as the USS *Sampson* (DDG-102) sailed for Auckland to celebrate the New Zealand Navy's 75th anniversary, marking the first visit of a U.S. warship to the country in 30 years.

New Zealand hopes to replace its P-3 patrol aircraft and also to acquire at least one new offshore patrol ship and a

new multipurpose vessel in the decade ahead.

North Korea conducted a fourth nuclear test in January 2016 and a fifth test in September. The new Pukuk-song-1 (Polaris-1) submarine-launched ballistic missile (SLBM), known in the West as KN-11, was launched successfully in August. The missile is thought to have been fired from North Korea's sole 2,000-ton Sinpo-class ballistic-missile submarine, also known as the Gorae-class, which is armed with a single missile tube and still is undergoing tests. Media reports indicate construction of large covered submarine docks and shelters is under way to hide submarine developments and operations from overhead intelligence collection. A second ballistic missile carrying submarine, fitted with multiple tubes, is now thought to be under construction as well.

Pakistan's new Chinese-operated deep-water port at Gwadar became fully operational in November 2016. The country also announced plans to acquire eight new Chinese submarines, likely Yuan-class diesel units with air-independent propulsion, for delivery between 2023 and 2028. Pakistan has begun upgrading its three Agosta 90B submarines domestically, and all are due back in service by the end of 2018. The country also has expressed interest in acquiring an SSN, as well as an SLBM capability, for sea-based deterrence in the years ahead.

The new Turkish-designed 17,000-ton replenishment tanker, the largest naval vessel ever built in Pakistan, was launched this past August for service by the end of 2017.

In September 2016, Pakistan launched its third 206-foot *Azmat*-class guided-missile patrol boat, and at least one additional unit is planned. Six new Chinese-built craft also are entering service with the Maritime Security Agency, including two 1,500-ton craft and four 600-ton boats.

The **Philippines'** new President, Rodrigo Duterte, announced a dramatic split with longtime ally the United

Sates last year—declaring, “America has lost,” and realigning his country with China and Russia. By early January 2017 the Philippines had hosted a Russian destroyer and naval auxiliary in Manila to cement the new ties. Duterte is redirecting future Philippine military efforts inward, to focus on counterdrug operations and internal security rather than Chinese encroachment in the South China Sea. Ironically, this redirection began just as Philippine maritime forces began planning for new equipment to defend and patrol its maritime borders.

Despite the changing tone from the top, some in the Philippine Navy remain optimistic about long-term ties with the United States and prospects for more upgrades and additional vessel acquisitions in the future.

Singapore welcomed the first of eight *Independence*-class littoral mission vessels into service this past May. The 1,250-ton craft, not to be confused with the U.S. *Independence* class, are all due for delivery by late 2020. Singapore also is working to enhance its submarine force, and two new Type 218SG

second 3,000-ton KSS-III submarine, the first of which was launched in May for service beginning in 2020.

In 2016 the first *Daegu*-class frigate under the FFX-II program launched; they will begin entering service in 2018. Three new *Sejong Daewang* (KDX-III)-class Aegis DDGs are planned for service in the future, and additional guided-missile patrol boats were ordered last year under the 210-ton PKX-B program, the first of which is expected to enter service in the early 2020s. South Korea’s third 4,900-ton *Cheon Wang Bong*-class tank landing ship was launched in October for service in 2018. A new 23,000-ton replenishment oiler and logistics support ship also is under construction for service in 2018.

Taiwan’s long-term wish list includes 4 large new destroyers, 3 frigates, naval helicopters, up to 12 new *Tuo Jiang*-class 500-ton missile patrol craft, and, most challenging, more than a half-dozen indigenously designed submarines. Last year Taiwan set up a domestic submarine development center to begin the long process of designing the new class, but its shipbuilding industry hopes for foreign assistance. On 1 July, Taiwan’s guided-missile patrol ship *Jin Chiang* accidentally fired an advanced HF III antiship missile during exercises near Tsoying. The missile flew northwest more than 40 miles before striking a Taiwanese fishing boat, killing the fishing boat’s captain and wounding several crew members.

Thailand’s first DW3000 frigate currently is under construction in South Korea and expected to enter service in 2018. A second unit is to be built domestically in the future. Thai shipyards are building new M58-class 190-foot patrol boats and their first M21-class 70-foot boat for inshore coastal patrol duties. A second 2,500-ton *Krabi*-class patrol ship also is planned for the future.

Vietnam’s fifth Russian Improved Kilo-class (Project 636) diesel submarine was delivered in early 2016, and the sixth and final unit is due by 2017. Two additional Modified Gepard-class



In the Philippines, two Russian warships docked in Manila for a five-day visit in early 2017. Philippine President Rodrigo Duterte (center) shakes hands with Russia’s Rear Admiral Eduard Mikhailov at the Udaloy-class destroyer *Admiral Tributs*.

In 2016, the Philippines Navy unveiled plans to acquire two new variants of the HDF-3000 frigate from South Korea, and two AW159 Lynx Wildcat naval helicopters were ordered to operate from these ships. The Philippine Navy also received three retired Australian *Balikpapan*-class 500-ton heavy landing craft last year, along with the first of ten Japanese multirole response vessels for the coast guard. In June the first of two impressive 11,500-ton *Tarlac*-class strategic sealift ships arrived from Indonesia for amphibious assault and humanitarian operations, and a second unit is due for delivery later in 2017.

In July, the U.S. Coast Guard transferred a third 3,000-ton *Hamilton*-class cutter for service as a Philippine frigate.

submarines are on order from Germany, with deliveries expected to begin in 2020.

South Korea is increasing its investment in antisubmarine warfare and ballistic missile defense in light of recent North Korean activities. The military is moving forward with plans to acquire up to 20 retired U.S. Navy S-3 Viking aircraft beginning around 2020 and is considering the purchase of P-8A maritime patrol aircraft as well. The eighth and final AW159 Lynx Wildcat naval helicopter was delivered in December 2016.

Five Type 214/1700 (KSS-II) submarines were operational by mid-2016, and four additional units are planned. This past summer construction began on the

(Project 11661) frigates also are on order from Russia. India plans to supply Vietnam with new offshore patrol vessels, as well as the ram-jet powered Brahmos antiship missile and possibly new heavyweight torpedoes. In 2016, the United States lifted its arms embargo against Vietnam, which is now considering acquisition of refurbished S-3 Viking or P-3 Orion maritime patrol aircraft.

EUROPE

Denmark's Navy took part in its first Rim of the Pacific (RIMPAC) exercise off Hawaii this past year, and the country is increasing defense collaboration with allies. The surface fleet is seeking acquisition of SM-2 Block IIIA surface-to-air missiles for use on *Iver Huitfeldt*-class guided-missile frigates and is considering adding BMD capabilities to at least one of the frigates during the 2020s. Denmark's air force took delivery of its first three MH-60R Seahawks last year, and all nine of the helicopters are expected in service by 2018.

Finland completed mid-life upgrades on the minelayer *Pansio* late in 2016 and similar upgrades are planned for two sisters of the class, to ensure service through the 2030s. Finland also is looking to acquire four new ice-capable offshore patrol ships for delivery beginning in the mid-2020s.

France plans to build a force of eight *Aquitaine*-class frigates under the Franco-Italian FREMM program; the third unit of the class was delivered in 2016. The first six warships are being optimized for antisubmarine warfare while the seventh and eight will emphasize anti-air warfare. France also plans to upgrade its Aster-30 naval surface-to-air missiles to engage a wider array of threats, including ballistic missiles.

Five new 4,000-ton multipurpose frigates are planned under the *Frégates de Taille Intermédiaire* (FTI) program, due to begin replacing the *La Fayette* class from the mid-2020s. Last spring France received the first of four new 2,000-ton multimission ships, built for

overseas patrol and support operations. Two more units are expected to enter service by late 2017, and a fourth unit of the class is planned. Four new 2,600-ton offshore patrol and logistics support vessels also are on order for delivery by 2019. France is working with the United Kingdom on off-board mine-countermeasures technology with new prototypes expected for testing by the early 2020s.

Six nuclear-powered *Suffren*-class submarines are planned under the *Baracuda* program, with deliveries to take

place between 2018 and 2029. The first of Germany's new 7,200-ton Type 125 frigates, known as the *Baden-Württemberg* class, began sea trials last April, and her commissioning is planned for 2017. Three sisters are due for delivery by 2020. Five 1,800-ton *Braunschweig*-class (K-130)

announcement that will integrate the German Navy's sea battalion, including its naval infantry force, into the Royal Netherlands Marine Corps. This will strengthen joint capabilities and permit shared German access to Dutch strategic sealift and amphibious assets.

The first of Germany's new 7,200-ton Type 125 frigates, known as the *Baden-Württemberg* class, began sea trials last April, and her commissioning is planned for 2017. Three sisters are due for delivery by 2020. Five 1,800-ton *Braunschweig*-class (K-130)



U.S. COAST GUARD (MARK BARNEY)

In September 2016, the U.S. Coast Guard transferred two Island-class cutters to Georgia. They are scheduled to be shipped to Georgia this summer. Here, Captain First Rank Ramaz Papidze raises his country's flag for the first time aboard one of the boats.

place between 2018 and 2029. In July 2016, France's last carrier-based Super Étendard fighter-bombers were retired from service, having been replaced by the more modern Rafale Marine jets.

The country's newly upgraded Atlantic 2 maritime patrol aircraft also was successfully put to the test over Iraq this past year, helping guide munitions to insurgent targets.

The **Republic of Georgia** accepted two retired Island-class cutters from the U.S. Coast Guard. Transferred on 30 September 2016, the 110-foot craft have been renamed the *Ochamchire* and *Dioskuria*.

Germany's strong collaboration with NATO allies led to a 2016 an-

corvettes recently entered service, and last year the Navy announced plans to double its buy to ten vessels by 2023. Design work continues on a new class of up to six MKS-180 multipurpose combat ships, formerly called the K-131 program, which are expected in service from the mid-2020s.

The Navy commissioned its sixth 1,850-ton AIP-capable Type 212A submarine this past October; two additional units are planned. In November 2016 the German Navy retired its last 390-ton Type 143A guided-missile patrol craft.

Greece has announced plans to return its fleet of retired P-3 Orion maritime patrol aircraft to operational

service. The ex-U.S. Navy P-3Bs were inactivated several years ago, but refurbishment or replacement of the aircraft has long been a priority. This past June Greece accepted delivery of its third and fourth German-designed, Greek-built Type 214 submarines, the *Matrozos* and *Katsonis*.

Iceland is returning to its former Cold War role as a base for NATO maritime patrol and antisubmarine warfare operations to monitor Russian activities in the North Atlantic. This past year U.S. Navy P-8A Poseidon maritime patrol aircraft began flying missions from Keflavik, and the country's valuable geographic location is again playing an important role contributing to defense of the Atlantic alliance.

Ireland's naval service took delivery of a third 2,000-ton *Samuel Beckett*-class offshore patrol ship this past October, and the Irish government announced plans to acquire a fourth unit by 2018.

Italy took delivery of its fifth *Carlo Bergamini*-class frigate under the Franco-Italian FREMM program, and five more of the 6,000-ton warships are planned by 2021. Each of the frigates will be optimized for either anti-submarine warfare or general purpose/land-attack capabilities. The *Minerva*-class corvettes continue to be retired and two more units were inactivated in 2016. Italy's new Pattugliatore Poliva-

lente d'Altura (PPA) program calls for construction of at least seven 4,500-ton multirole offshore patrol vessels in three variants, with armament ranging from light weapons to heavy missiles. Delivery of the first PPA is expected in 2021. In the summer of 2016 Italy began construction on a new 23,000-ton logistics support and replenishment ship for delivery in 2019. Italy also is building a new 22,000-ton amphibious assault ship able to transport 1,000 troops, landing craft, and at least five helicopters; delivery is planned for 2022.

The Italian Type 212A submarine *Romeo Romeo* began sea trials last March, and the 1,800-ton submarine will commission in 2017 as the fourth and final boat of her class. The Navy plans to order 15 F-35B short take-off and vertical landing (STOVL) aircraft to replace its carrier-borne AV-8B Harriers in service. To help fulfill maritime patrol requirements, the air force has ordered four new ATR-72 naval aircraft for delivery by the end of this year.

The **Netherlands** is beginning design work on its next generation of warships and submarines. Increased European coordination is expected to lead to more collaboration, such as the 2016 announcement that Germany's sea battalion will be integrated into the Dutch Marine Corps. This combined amphibious force is expected to operate together

from the large new 28,000-ton joint support ship *Karel Doorman*.

Norway is hoping to replace its six *Ula*-class submarines with four new boats beginning in the mid-2020s. The country also plans to replace its P-3 Orion patrol aircraft with five new U.S. P-8A Poseidons beginning in the early 2020s. The coast guard plans to purchase three ice-breaking support vessels for delivery between 2018 and 2023 to replace the three *Norkapp*-class cutters now in service.

Poland's long-delayed 2,000-ton MEKO A-100-class patrol ship *Slazak* is nearing completion for delivery in 2018. The first new Kormoran II-class mine countermeasures vessel began sea trials last July, and two sisters are planned for service. A new replenishment oiler is sought by 2020 and a second unit may be ordered for delivery by 2024. Plans for three domestically built Miecznit-class coastal defense craft and three patrol ships are being finalized.

The Navy also hopes to acquire a force of three submarines from the mid-2020s and is considering leasing a diesel submarine until the new boats are ready for service. Poland is in the market for naval and antisubmarine warfare helicopters to replace its Cold War-era Mi-14s. This past year the first two upgraded W-3RM Anakonda helicopters entered service with the Naval

The first of Germany's new *Baden-Württemberg*-class frigates began sea trials last April.



NAVAL PRESS SERVICE (M. NITZ)



Russia's new *Ivan Gren*-class tank landing ship began sea trials in 2016. The original planned buy of six reportedly has been reduced to two.

Aviation Brigade for search-and-rescue duties, and three additional helicopters will complete upgrades in the near future.

In 2016, construction to establish an Aegis Ashore ballistic missile defense site began in Poland. The NATO facility will employ Aegis system components in conjunction with SM-3 Block IIA missiles once it becomes operational in 2018.

Portugal's first Stanflex 300 patrol ship was commissioned in May 2016 following modernization and overhaul. The vessel, renamed the *Tejo*, is one of four retired units transferred from Denmark in 2014. Portugal's two Type 209PN attack submarines will undergo maintenance overhauls in Germany. Work on the *Tridente* is expected to be completed in 2018, while sister *Arpão* will be back in service by 2020. Both submarines are expected to undergo major mid-life extension upgrades by the late 2020s.

Romania commissioned the first of NATO's new Aegis Ashore ballistic missile defense sites at Deveselu in May 2016. The facility includes SPY-1 radar, Mk-41 vertical launch systems housing SM-3 Block 1B missiles, and linkages to command, control, communications, computers, and intelligence systems. Armed with three eight-cell SM-3 launchers, the new ashore system will coordinate with four BMD-capable U.S. destroyers already stationed in

Rota, Spain, and a BMD site being built in Poland to help protect NATO allies from limited missile attacks.

Russia has exercised renewed confidence on the international stage, as reflected in its maritime operations and naval acquisition plans. Refit and modernization of the 26,000-ton nuclear powered *Kirov*-class cruiser *Admiral Nakhimov* is expected to be completed by 2020, and work on the *Petr Velikiy* is planned to follow in 2022. This past October work began on the first 3,400-ton *Derzky*-class (Project 20386) frigate, with the first unit expected in service around 2021. Additional Buyan-M (Project 21630)-class corvettes were ordered in 2016, and approximately ten are expected in service by 2019.

Despite the bravado, economic sanctions are having an impact on Russian shipbuilders, and three incomplete *Admiral Grigorovich* (Project 11356M)-class frigates are being transferred to India because they require Ukrainian gas-turbine engines that are blocked from import. Russia has enough Ukrainian engines to equip three units, including the first of class, *Admiral Grigorovich*, which entered service in June 2016. Russian industry is working to develop its own naval gas turbines, and in the near term its shipyards remain focused on smaller warships such as the 2,200-ton *Gremyashchy*-class (Project 20385) corvette and the *Steregushchiy*-class (Project 20380) frigates.

The first new 6,000-ton *Ivan Gren*-class (Project 11711) tank landing ships began sea trials in late 2016. Orders for the class reportedly have been reduced to two, and a new type of large deck amphibious assault ship is planned, with construction expected to begin by 2021. Russia ordered two new Project 23550 Arctic patrol ships in 2016, with both to be delivered by 2020. Four 800-ton Aleksandrit-class (Project 12700) minesweepers are on order and as many as seven additional units may be planned. Russia recently has begun building new warships in Crimea, and this past May its third 800-ton Karakurt-class (Project 22800) corvette was laid down at a shipyard in Feodosiya. The first of 18 Karakurts is expected to enter service in 2017.

Russia's submarines are operating at tempos not seen since the Cold War. Three of Russia's Borey-class (Project 955) SSBNs are in now service, with eight units expected by the early 2020s. Russia also reportedly is planning a new high-speed underwater "Kanyon" drone that could be fitted with a massive nuclear warhead to detonate near port cities. This past year the former Delta IV-class submarine K-64, long thought to have been scrapped, was revealed to have been lengthened and converted into a mothership for unmanned vessels and special missions. The first of Russia's advanced *Severodvinsk*-class (Project 885) SSGNs has been declared operational. Seven more sisters are being built to an enhanced design (Project 855M), with deliveries set to begin in 2018. Older Akula-class submarines also are being returned to duty following long-delayed repairs and upgrades. Russia's sixth project 636.6 Improved Kilo-class diesel submarine was reported operational by early 2017, and six additional units are being built for delivery between 2019 and 2021. The second and third

units of the Lada class (Project 677) continue to suffer delays and are not due until 2019 at the earliest. Air-independent propulsion systems are under consideration for the class in the 2020s.

This past fall Russia's sole aircraft carrier, the 60,000-ton *Admiral Kuznetsov*, sailed through the Mediterranean to provide support for Russian operations in Syria. The vessel arrived at her first combat deployment in November, belching black smoke from ongoing propulsion problems. By January 2017, she had completed operations and was returning home, having lost a MiG-29K and Su-33 in non-combat crashes. Russia now plans an extensive multiyear overhaul and refit for the car-

rier, and newer MiG-29K aircraft will replace the older Su-33s on board.



The Royal Navy accepted delivery of the first of four Tide-class tankers, the *Tidespring*, in January 2017. Built by South Korea's Daewoo Shipbuilding and Marine Engineering, she is expected to enter service later this year.

rier, and newer MiG-29K aircraft will replace the older Su-33s on board.

Spain is developing a new class of five 470-foot frigates under the F110 program to replace its *Oliver Hazard Perry*-class ships beginning in the mid-2020s. Redesign efforts have been completed on Spain's S-80 submarine program, allowing the new class of four AIP-equipped boats to transition back into production following significant design errors. First of class *Isaac Peral* is expected for delivery in 2021. Spain's fleet of EAV-8B Harrier II+ V/STOL fighters are expected to retire

by the late 2020s, but F-35B STOVL fighters remain a cost prohibitive replacement. The Navy has two SH-60F Seahawk helicopters on order from the United States and additional units are planned.

Sweden has ordered two new A26 multimission submarines with AIP capabilities to replace the *Gotland* class. The A26 boats will begin entering service in 2022 and are designed for shallow water littoral operations and feature extensive modularity. Sweden also is working on a new Type 47 lightweight torpedo optimized for use in the Baltic Sea to replace the current generation Type 45.

Turkey is building two new Ada-class corvettes for service by 2020 and

four air-defense frigates are to begin entering service from the mid-2020s. This past spring construction began on Turkey's locally built 28,000-ton big deck amphibious assault ship, based on the Spanish *Juan Carlos I* class, due for delivery in 2021. A new 22,000-ton auxiliary replenishment and support ship is expected in the 2020 time frame and a second unit also is under consideration.

The first of six domestically built, German-designed Type 214 AIP submarines is expected in the early 2020s, while mid-life upgrades are being

planned on existing submarines, including four *Prevez*-class (Type 209/1400) boats. A new class of domestically designed and built submarines may replace Turkey's foreign-built submarines beginning in the 2030s.

Ukraine's government has awarded a contract to modernize its flagship and largest surface combatant, the 3,600-ton Krivak III-class (Project 11351) frigate *Hetman Sahaydachniy*, by the end of 2018. Construction also recently began on four new 51-ton Gyrza-M-class (project 58155) armored riverine boats being built under a March 2016 contract.

The **United Kingdom** is moving forward with plans to replace its *Vanguard*-class SSBNs. The four new 17,000-ton submarines are expected to begin entering service in 2028 and will be known as the *Dreadnaught* class.

Last spring the Royal Navy commissioned HMS *Artful*, its third *Astute*-class nuclear-powered attack submarine. Seven *Astute*-class SSNs are planned by the mid-2020s, replacing the *Trafalgar* class.

Sea trials are set to begin on the first of Britain's two full-sized 70,000-ton *Queen Elizabeth*-class aircraft carriers in 2018, with the first operational deployment planned for 2021. The second unit, the *Prince of Wales*, is expected to be delivered in 2019. A total of 138 F-35B STOVL strike fighters are being acquired jointly by the Royal Navy and Air Force. The Navy received its 30th and final upgraded Merlin HM.2 anti-submarine warfare helicopter, converted from HM.1 configuration, this past summer. Merlins also will provide airborne surveillance and control functions for the new carriers via "Crow's Nest" kits, which are expected to reach the fleet in 2019, enabling replacement of the aging Sea King ASaC.7 helicopters. Current plans also call for 28 HMA.2 Lynx Wildcat helicopters to replace the fleet's older Lynx HMA.8s, the last of which will retire by the end of 2017. The United Kingdom has ordered nine P-8 Poseidon maritime patrol aircraft from the United States for delivery between 2019 and 2021.

Britain's plan to recapitalize its surface fleet includes acquisition of eight advanced Type 26 frigates and five smaller, less expensive Type 31 general-purpose frigates. The first 5,400-ton Type 26 will begin construction in mid-2017 for service entry in the mid-2020s, and a similar time line is planned for the Type 31s. The current fleet of Type 23 frigates is expected to begin retiring in 2023, and the full class is expected to be out of service by 2035. All six new Type 45 *Daring*-class air-defense destroyers are now in service, but newly uncovered engineering problems will require class-wide repairs. To save money, the Royal Navy plans to retire all Harpoon antiship missiles from service by 2019, leaving the surface fleet without an over-the-horizon antiship capability. The helicopter-launched Sea Skua antiship missile also will retire by late 2017, and its replacement, the Sea Venom, will not be available until 2020.

Two additional River-class offshore patrol vessels were ordered in 2016. These new batch 2 variants will be modified versions of the original River-class design. The United Kingdom and France are coordinating efforts on next generation off-board mine countermeasures systems under the Maritime Mine Countermeasures program. The *Sandown* class of minehunters also is being upgraded from 2018 on to enable enhanced shallow-water operations. Delivery of the first of four new Tide-class tankers, the *Tidespring*, took place in January 2017. These 37,000-ton replenishment ships are being built in South Korea under the British Military Afloat Reach and Sustainability program. A new class of three cargo and ammunition transport vessels, known as Future Solid Support ships, is planned for entry into the fleet from the mid-2020s.

MIDDLE EAST/AFRICA

Algeria commissioned the newly built frigate *Erradii* this past April; she is the first of at least two German-built MEKO A-200-class warships planned for Algerian service. Two additional units may be ordered in the near future.



Algeria commissioned the first of at least two planned German-built MEKO A-200-class frigates—the *Erradii*—this past April.

NAVAL PRESS SERVICE (M. NITZ)

Six Super Lynx 300 naval helicopters, for use from the vessels, will begin entering service this year. In the summer of 2016, Algeria received its third C28A-class corvette from China. The 3,000-ton warships are fitted with Chinese weapons and Western radars; additional units may be planned.

Angola is working to cultivate its internal shipbuilding capabilities and its Navy has ordered a range of vessels from the Middle Eastern firm Privinvest. No details on the numbers or type of vessels have been released, but the deal also includes development and operation of a new Angolan shipyard capable of construction and vessel servicing.

Bahrain's coast guard is acquiring six new 59-foot patrol boats from Turkey, and up to six more are under consideration. Bahrain also is working to increase accommodations for foreign warships and a new British base is set to begin operations there in 2017.

Egypt is in the midst of a major naval expansion. Two 21,000-ton French-built *Mistral*-class helicopter-carrying assault ships, the *Gamal Abdel Nasser* and *Anwar El-Sadat*, were delivered in 2016. The vessels originally were intended for Russian service but were sold to Egypt after that deal was called off. Egypt plans to acquire a fleet of Russian Ka-52N maritime helicopters for operation from the new assault ships. Four 2,500-ton Gowind-class corvettes are on order, with the first

ship being built in France for delivery by 2019 and three sisters planned for construction in Egypt.

The first of four new German-built Type 209/1400 submarines was delivered this past December, and a second unit has been launched. The new submarines will be armed with German torpedoes, and in 2016 the United States approved sale of Sub-Harpoon Block II missiles for use on board the class.

Equatorial Guinea has ordered two C295 aircraft for delivery by the end of 2017. At least one of the aircraft will be configured for maritime patrol duties.

Iran shows few signs of moderating its behavior in the Persian Gulf region. In January 2016, ten U.S. sailors and their combat craft were captured and held overnight after straying into Iranian waters. In August, three Iranian patrol boats approached the U.S. patrol craft *Squall* (PC-7) at high speed, turning away only when the U.S. vessel fired warning shots. On 8 January 2017 the destroyer USS *Mahan* (DDG-72) fired warning shots at four Iranian Islamic Revolutionary Guard Corps Navy boats operating dangerously close to the destroyer. Iran lent out its air bases to Russian combat aircraft last summer, permitting Tu-22M Backfire bombers to strike targets in Syria directly from Iran.

Iran also has been accused of supplying weapons to Yemini rebel forces in violation of U.N. Security Council resolutions. Large caches of these weapons



New U.S. MK V special operations craft have been approved for sale to Qatar.

U.S. NAVY (A. HARDING)

have been seized by Western navies before reaching their destination. The country is continuing to develop new naval platforms and weapons with a priority on small boats, antiship missiles, submarines, and unmanned systems.

Israel's Navy is undergoing significant modernization. Four new 2,000-ton Sa'ar VI-class guided-missile corvettes are on order from Germany, with delivery to begin in 2019, and Israel recently announced plans to modernize its three U.S.-built *Lahav* (Sa'ar V)-class corvettes and eight Israeli-built *Hetz* (Sa'ar 4.5)-class missile patrol craft, also by 2019. Israel plans to acquire eight secondhand SH-60F Seahawk helicopters from the U.S. Navy for use with the new corvettes. By 2020 naval command-and-control upgrades will be completed across the fleet.

Israel's fifth *Dolphin*-class submarine was delivered from Germany in early 2016, and a sixth unit is planned for 2019. Three additional units are planned to replace the first three non-AIP-capable submarines of the class.

The **Ivory Coast's** coastal patrol forces are adding new assets, including a third and final 111-foot RPB-33 patrol vessel that was delivered from France

this past year. Additional patrol craft and small boats are planned for acquisition to help combat maritime piracy, illegal fishing, and smuggling.

Kuwait has ordered 29 47-foot fast coastal interceptor craft from the United States, with deliveries to be completed by the end of 2017. Eight older P37-class guided-missile patrol boats will begin upgrades in France in the near future. Eight vessels were ordered from the United Arab Emirates last January, although details on the order have not been released. The Kuwaiti Air Force and National Guard have ordered 30 H225M Caracal helicopters for search-and-rescue and naval operations.

Libya saw continued fighting against Islamic State militants in 2016. U.S. forces conducted air strikes as part of Operation Odyssey Lightning in support of the Libyan government, and the European Union began training Libyan coast guard and naval forces as part of Operation Sophia to help the country address human trafficking and smuggling at sea.

Mauritania welcomed two Chinese patrol vessels into service this past year. Measuring roughly 200 feet, each is fitted with a medium-caliber main gun and stern ramp for small boat operations.

Nigeria is struggling to deal with recent increases in maritime piracy. The Niger Delta and Gulf of Guinea are seeing a dangerous rise in crime and kidnapping for ransom, in some cases 50 or more miles from shore. By early 2016 the new Falcon Eye sensor system was operational, helping to provide enhanced maritime domain awareness and surveillance capabilities. In February 2016 the Navy conducted a successful opposed boarding of the hijacked tanker MT *Maximus*, capturing pirates and freeing her crew.

In September Nigeria's second 1,800-ton P-18N-class corvette was delivered from China, and dozens of new patrol assets have begun entering service. Last August Nigeria took delivery of nine secondhand small craft from Sri Lanka and 30 new 27-foot locally built patrol boats. At least 20 additional 27-foot boats are planned.

Oman is investing in coastal security and has been working to boost its port facilities to entice more foreign naval visits. The port at Duqm is expanding with the addition of a naval base, and the country is making plans for a permanent British naval presence that will include sufficient facilities to

support the new *Queen Elizabeth*-class aircraft carriers and smaller warships.

Both of Oman's new 236-foot high-speed support vessels had been delivered from Australia by late 2016, as was a fourth and final Singaporean-built 1,250-ton Al Ofouq-class patrol vessel. The Omani police forces will receive a number of new interceptor craft and coastal patrol boats, with at least five 115-foot boats due for delivery by the end of 2017.

Qatar has ordered more than 20 new patrol craft ranging in size from 75 to 164 feet, all due for delivery in the next few years. New Mk V special operations craft have been approved for sale from the United States, as have RIM-116C rolling airframe missiles to upgrade warship point-defense capabilities. Italy has received orders to build four 345-foot corvettes, two 197-foot offshore guided-missile patrol craft, and a logistics support ship with amphibious capabilities, while European manufacturer MBDA has agreed to sell Qatar new Marte ER and Exocet Block 3 antiship missiles, Aster-30 medium-range surface-to-air missiles, and vertically launched Mica short-range surface-to-air missiles. A new naval base is scheduled to open in 2017 south of Doha, and ten maritime helicopters are expected to join the fleet in the next decade.

Saudi Arabia's naval forces remain engaged off the coast of Yemen, leading a naval coalition to prevent arms from reaching Houthi rebels. In late January 2017 a Saudi frigate operating west of Hodeida was damaged in a suicide boat attack.

Six new 2,500-ton corvettes are being procured as are more than 100 small interceptor, patrol, and special mission boats from U.S. and European shipyards. Four multimission surface combatants, to be based on the U.S. *Freedom*-class littoral combat ship design, are planned for the future. Ten MH-60R Seahawk naval helicopters are on order from the United States, with deliveries to take place between 2018 and 2019. In the future, Saudi Arabia hopes to

add fixed-wing maritime patrol aircraft to its naval inventory, along with more UAVs for naval support.

South Africa hopes to buy six new patrol vessels for service by 2024, and a new hydrographic survey ship is planned by 2020. The Navy is upgrading its internal communications systems, and there have been reports that a new amphibious dock landing ship is being sought for the future. Acquisition of new torpedoes for its submarine fleet is under consideration, as is purchase of much-needed maritime patrol aircraft.

Syria agreed to a major Russian expansion of its naval base at Tartus to support more and larger surface combatants and submarines. As part of the deal, Russia has agreed to defend the base, conduct search-and-rescue duties as needed, and help Syria restore its naval capabilities, which have been ravaged and neglected during the country's civil war.

Tanzania has received several small patrol boats and two 92-foot landing craft from China. At least two new patrol craft also were delivered by the Dutch firm Damen. In September Tanzania conducted amphibious exercises that included some of these newly acquired assets.

Tunisia has ordered two new 1,400-ton offshore patrol vessels, expected for delivery by late 2018. Two additional sisters, built in Romania to a Dutch design, may be ordered in the future. Tunisia also has ordered additional Scan Eagle UAVs for coastal patrol duties.

The **United Arab Emirates** remains active in naval operations off the coast of south Yemen, and in October its leased high-speed logistics vessel *Swift* was seriously damaged by a Houthi rebel antiship missile attack. The nation's sixth and final *Baynunah*-class corvette has been delivered, and two 230-foot Sea Axe offshore patrol vessels are on order for delivery by the end of 2017. Eight inshore patrol vessels are being built for coastal security missions, and purchases of additional 500-ton Falaj 2-class patrol combatants

and antisubmarine-warfare-capable warships are under consideration.

Yemen has been hit hard by the ongoing civil war between its government and the Houthi rebels. Al Qaeda also is operating in the south and east of the country. Arms have continued flowing to rebel forces from Iran, despite an international effort to stem the tide. Several large Yemeni-bound arms caches were seized by Western navies this past year, in the Persian Gulf and off Oman. Rebel forces unsuccessfully targeted several U.S. warships in the region in 2016, and the U.S. Navy missile strikes in response destroyed several insurgent radar sights.

AMERICAS

Argentina hopes to purchase secondhand corvettes and amphibious ships, and its industry is working to maintain older systems and weapons as long as possible. New naval patrol and multimission craft are required, as are new maritime patrol aircraft. In 2016 the Navy conducted live-fire tests on domestically upgraded MM38 Exocet antiship missiles, with mixed results, and locally upgraded heavyweight torpedoes, which are arming its submarine fleet.

The **Bahamas** defense force is focused on counterdrug operations. Extensive mid-life modernizations on both 199-foot *Bahamas*-class patrol craft will be completed in 2017, and nine new craft, including a mix of Stan Patrol 3007, Stan Patrol 4207, and Stan Lander 5612 vessels, are on order. Enhancements and dredging work on several naval bases took place in 2016, and the Bahamas is expected to consider acquiring new patrol aircraft and helicopters in the future.

Bolivia has ordered 16 new 2,500-ton riverine transport barges and two 5,400-horsepower tug boats from China. Deliveries are expected to be completed by the end of 2017.

Brazil has established naval priorities for the future that include submarine development, corvette acquisitions, and repair and modernization



The Canadian frigate Vancouver successfully fired a Harpoon Block II missile against a shore target last April.

of its 55-year-old 33,000-ton aircraft carrier *São Paulo*. The fleet modernization effort, still in its early stages, includes requirements for five new 6,000-ton frigates, five 1,800-ton offshore patrol vessels, and a 24,000-ton logistics and support ship. Eventually Brazil hopes to acquire a new 40,000-ton aircraft carrier. In the near term, the procurement of four corvettes by 2023 remains paramount. Smaller scale efforts include a program to develop and build new 500-ton coastal patrol vessels. Five planned 440-ton Vigilante 400 (*Macaé*)-class patrol combatants have been facing delays and their future remains uncertain.

Four *Scorpène*-class diesel submarines, to be known as the *Riachuelo* class, are on order, with deliveries expected to begin after 2018. The long-delayed Brazilian SSN program has not been canceled, but development appears to have slowed to a crawl. The air force has ordered three additional C295 aircraft with search-and-rescue and maritime patrol capabilities. The Navy has ordered H225M multirole helicopters, while the Marine Corps plans to operate FT-100 Horus small surveillance UAVs and has purchased 23 upgraded AAV7A1 amphibious assault vehicles for delivery through 2017.

Canada's *Halifax*-class frigate modernization efforts are nearly complete, and the upgraded warships all will have returned to full service by 2018. The recently modernized *Vancouver* successfully test fired a Harpoon Block II antiship missile in land-attack mode last spring, marking the first time a Canadian warship has demonstrated the ability to conduct surface-to-surface land-attack missions. A new class of up to 15 multirole warships is expected to begin entering service in the mid-2020s as replacements for the *Halifax*-class frigates and *Iroquois*-class destroyers.

Canada's four *Victoria*-class submarines have come of age following serious teething problems. Future upgrades, to include the possible addition of AIP capability, are under consideration.

In October Canada retired the oiler *Preserver*. She and retired sister *Protecteur* will be replaced by at least two new 21,000-ton *Queenston*-class joint support ships beginning in the early 2020s. Until the new class is ready for service, Canada will operate the refitted commercial container ship *Asterix* on a temporary basis beginning in 2017. Six new 338-foot *Harry DeWolf*-class Arctic and offshore patrol ships also are being

built, with delivery of the first vessel planned for 2018.

By early 2017 construction had begun on the Canadian Coast Guard's third and final 208-foot offshore fisheries science vessel, with deliveries expected to begin by the end of this year. Construction also will begin shortly on a 282-foot offshore oceanographic science vessel. A new polar icebreaker, the *John G. Diefenbaker*, is expected to enter service in the early 2020s to help address a looming Arctic capability gap.

Chile hopes to upgrade its former British Type 23 frigates with new combat systems during the next few years and also would like to expand its shipbuilding and maintenance capabilities by adding a new floating dock at state-owned ASMAR shipyard. The aviation arm has announced plans to upgrade two P-3A Orions, extending their service into the 2030s.

Colombia is looking to expand its surface fleet and hopes to acquire new frigates during the coming decade. The Navy also is considering procuring large dock landing ships and received two new locally built 150-foot amphibious landing craft in July for military transport, riverine, and coastal humanitarian missions. In late December 2016 the first 12.5-ton LPR-40 Mk 2 riverine patrol boat began sea trials, and two additional units have been ordered. As many as 16 may eventually enter service. A third 1,800-ton OPV-80-class offshore patrol vessel was launched late in 2016 and will be fitted with heavier armament and more powerful engines than previous units when she enters service by the end of 2017. The Navy is working to expand its coastal patrol capabilities in the Caribbean Sea and set up a new facility in Coveñas for UAV operations.

Honduras has ordered a new 150-foot logistical support and transport vessel from Colombia to help boost its naval capabilities; delivery is set for the end of the 2017.

Jamaica's defense force decommissioned its three largest coast guard craft, the *Cornwall*, *Middlesex*, and *Sur-*

rey, last November. Two new vessels built to the same 205-ton Stan Patrol 4207 design are on order as replacements. The new vessels will be named the *Cornwall* and *Middlesex* and are due for delivery in 2017.

Mexico's sixth 1,600-ton *Oaxaca*-class patrol ship was launched last year for delivery early in 2017; she is the second unit built to an improved design. Two more sisters are planned for the future. A new 175-foot logistics transport ship, the *Isle Maria Madre*, built to the Fast Crew Supplier 5009 design, was launched locally. Three more 250-ton *Tenochtitlan*-class patrol craft have been ordered. Mexico is expanding its maritime surveillance capabilities through the use of new UAVs such as the vertical take-off and landing variant of the Arcturus T-20, which Mexico deployed last year to protect fisheries and help counter drug trafficking.

Peru's first of two planned 10,000-ton amphibious transport docks was launched late in 2016 and is expected to commission in 2018. The vessels are based on the Indonesian *Makassar* class and are being built in South Korea. A new 6,000-ton oceanographic and polar research ship named the *Carrasco* was launched in Spain last May. The second 350-ton *Manuel Clavero*-class river gunboat was expected in service during 2017 and additional riverine boats are planned. The coast guard's fourth 250-ton river platform recently joined the fleet, and more than a dozen sisters are expected by 2018 to help provide medical and support services along the Amazon River.

The **United States** has begun adjusting to a new administration that has signaled dramatic changes while promising to increase the size of the Navy, boost military spending, and control the cost of major defense programs. The first 100,000-ton *Gerald R. Ford* (CVN-78)-class aircraft carrier is nearing completion and is expected for delivery by the end of 2017. The second unit of the class, to be named the *John F. Kennedy* (CVN-79), began construction in 2015 and is expected to enter service

around 2020. A third unit will be named the *Enterprise* (CVN-80).

In mid-2016 the Navy announced that the SSBN(X) *Ohio*-class replacement program, expected to begin construction in 2021, will be known as the *Columbia* class (SSBN-826). Twelve *Columbia*-class boats will replace the current 14 *Ohio*-class SSBNs beginning in the early 2030s. Last October the *Illinois* (SSN 786) was commissioned into service as the 13th *Virginia*-class nuclear-powered attack submarine. The future *Virginia*-class submarine *Washington* (SSN-787) was launched on 25 March, while the future boats *South Dakota* (SSN-790) and *Delaware* (SSN-791) began construction last spring. Three older *Los Angeles*-class SSNs were retired from service last year.

Ticonderoga (CG-47)-class cruisers are entering the pipeline to begin upgrades under the cruiser modernization program. By the end of 2017 six cruisers are scheduled to have started modernization efforts to extend their service lives and enhance combat capabilities. On 15 October the *Zumwalt* (DDG-1000), namesake of a new class of stealthy 15,000-ton multipurpose destroyers, entered service. Despite being commissioned, she is not expected to be fully operational until 2018. Two sisters remain under construction: the future *Michael Monsoor* (DDG-1001) was launched last June, while the future *Lyndon B. Johnson* (DDG-1002) is now roughly half complete.

In December 2016 the Navy accepted its 63rd *Arleigh Burke* (DDG-51)-class guided-missile destroyer, to be named the *John Finn* (DDG113). A 64th unit, the future *Ralph Johnson* (DDG-114) is expected for delivery by the end of 2017. In the near future the Navy also is planning to begin construction on its first Flight III variant of the class, which will be fitted with the advanced SPY-6 air and missile defense radar. Two new littoral combat ships entered service in 2016. The *Detroit* (LCS-7), fourth ship of the *Freedom*-class (LCS-1), was commissioned in August, while the *Montgomery* (LCS-8), fourth ship

of the *Independence*-class (LCS-2), entered service in September. The current program calls for a combined total of 40 LCSs and future frigates to be built, the latter of which will incorporate heavier armament and increased defensive capabilities.

The second *America* (LHA-6)-class 45,000-ton amphibious assault ship will be named the *Tripoli* (LHA-7) and is expected for delivery in 2018. A third unit, to be named the *Bougainville* (LHA-8), will incorporate a well deck, in contrast to LHA-6 and LHA-7, which were optimized for aviation operations. The *John P. Murtha* (LPD-26), tenth *San Antonio* (LPD-17)-class dock landing ship, was commissioned on 8 October, and an 11th unit, to be named the *Portland* (LPD-27), has been launched. Funding also was approved to build one more of the class, to be named the *Fort Lauderdale* (LPD-28), with delivery planned for the early 2020s. A sixth and seventh *Spearhead*-class expeditionary fast transport, the *Brunswick* (T-EPF-6) and *Carson City* (T-EPF-7), were delivered this past year, and two more sisters are expected to be handed over in 2017. Twelve of the class are eventually planned.

Construction is under way on the second *Lewis B. Puller* (T-ESB-3)-class expeditionary mobile base (T-ESB), and a third unit of the class is planned. Seventeen new *John Lewis* (T-AO-205)-class replenishment oilers, formerly known as T-AO(X), are planned, with construction on the first vessel set to begin in 2018. The Navy also saw a number of support ships retire this past year, including salvage ships *Safeguard* (T-ARS-50) and *Grapple* (T-ARS-53) and the fleet tug *Navajo* (T-ATF-169).

By fall 2016, 25 carrier-based variants of the Lightning II strike fighters had been delivered to the fleet, out of a total planned buy of 260 F-35Cs for the Navy and 63 for the Marine Corps. Three hundred forty F-35B STOVL variants also are planned for Marine Corps service, with roughly 50 operational by early 2017. All but 10 of the 304 planned F/A-18E and 280 F/A-18F

Super Hornets had been delivered by late 2016, as had 126 out of a planned 160 EA-18G Growlers. Twenty-seven of the new E-2D Advanced Hawkeye airborne early warning aircraft were in service by the end of the year out of a total of 75 eventually expected to be in operation. Roughly 50 P-8A Poseidon maritime patrol aircraft had entered the fleet by the beginning of 2017, and 109 are projected to be in service by 2023.

New Navy and Marine Corps rotary-wing aircraft are entering service as well, with more than 230 MH-60R Seahawks now delivered out of an eventual 280 planned. The last remaining SH-60F carrier-based antisubmarine-warfare helicopters were retired this past year. The Marine Corps hopes to procure a total of 360 MV-22B Ospreys, and 264 of the tilt rotors had been delivered by the start of the fourth quarter of 2016. A total of 59 AH-1Z Viper attack helicopters were in service out of 189 that will eventually be built

or converted from existing AH-1W Super Cobras. Low rate production of the Marine Corp's new CH-53K King Stallion helicopter is expected to begin by the end of 2017, with 200 of the aircraft planned. New unmanned surface, underwater, and aerial vehicles are being procured, including a total of 68 MQ-4C Triton Broad Area Maritime Surveillance (BAMS) systems, the first of which is expected to reach early operational capability in 2018.

By late 2016 only five 378-foot *Hamilton*-class high endurance cutters remained in Coast Guard service, along with five of the new 418-foot *Bertholf*-class National Security Cutters. Nine National Security Cutters are eventually planned for service; the sixth unit, the *Monro* (WMSL 755), was delivered in late 2016. A seventh unit, the *Kimball* (WMSL-756) was launched on 17 December. A new class of 25 offshore patrol cutters is expected to begin entering Coast Guard service in 2021 to replace

the 270-foot *Bear*-class and 210-foot *Reliance*-class medium endurance cutters. By late 2016 a total of 21 Sentinel-class fast response cutters, based on the Stan Patrol 4708 design, had been delivered to the Coast Guard, with a planned total of 58 units expected eventually. The Coast Guard is looking to enhance its Arctic capabilities as well, and construction on a new class of polar icebreaker could begin in 2020.

Uruguay's equipment and maintenance shortages remain rampant; reportedly only 16 percent of its vessels are considered operational. Unmet requirements call for improved coastal surveillance and monitoring in the form of new offshore patrol vessels, small boats and craft, naval helicopters, and fixed-wing maritime patrol aircraft.

■ **MR. WERTHEIM** is a defense consultant in the Washington, D.C., area and author of the 16th edition of *The Naval Institute Guide to Combat Fleets of the World* (available from the Naval Institute Press).

