

# Off the Cliff

## Aerospace developments 2012

by ERIC TEGLER

Nothing in 2012 consumed defense planners in the United States and abroad like America's looming budget crisis. Programmed cuts to the world's largest defense budget and the prospect of further cuts from Congress' self-imposed sequestration touched every aspect of defense aerospace acquisition.

**T**he halted growth of U.S. defense spending was evident in the administration's 2013 budget, which received congressional approval to cut \$487 billion over the next decade. Without resolution of the broader budget impasse, another \$500 billion in cuts would automatically take effect, a prospect Secretary of Defense Leon Panetta referred to as "unworkable" and a "disaster." Despite the elections having been decided, the "fiscal cliff" negotiations left sequestration delayed until March but unresolved.

The uncertainty had been driving decisions all year, however. In January 2012, Boeing began dispersing defense work from its mammoth Wichita, Kan., plant to other company facilities. The plant is set to close in 2013, signaling a likely round of industry plant closures, according to consultant Deloitte LLP, which forecast that overcapacity would affect one in four defense workers. The budget uncertainty drove more decision-making midyear as aerospace firms reduced or deleted buys of long-lead items for programs considered at risk.

At-risk programs weren't necessarily those with poor performance. They were more likely weapon systems that

did not fit with the Obama administration's strategic "pivot" to the Pacific. The platforms, weapons, and sensors so in demand in Afghanistan and previously Iraq will find little to no funding as the acquisition of new, longer-range manned/unmanned ISR (intelligence, surveillance, and reconnaissance) aircraft/sensors, ballistic and cruise missile defenses, and a Long Range Strike bomber take precedence.

With 80 percent of U.S. intelligence, communications, and targeting capacity dependent upon space-based assets and clear Chinese investment in various space-attack strategies, fortifying America's overhead constellations will be a priority. So too will be fielding less centralized platforms, and systems less vulnerable to cyberattack.

While 13 years of defense spending increases come to a close in the West, expenditures in Africa, the Middle East, Asia, and, notably, Russia (up 9.3 percent) continue to rise. In China, the results were manifest in the launch of its first aircraft carrier, the *Liaoning* (formerly reported to be named *Shi Lang*), and the debut of new unmanned systems and new fighter aircraft at the Zhuhai Air Show. The JF-17 Thunder has been the subject of speculation since 2011, but a second

little-known stealth fighter, the J-31, was revealed. Fitted with a pair of Russian-supplied Klimov RD-93 turbofans, it bears an unsurprising resemblance to the F-35 and has already flown.

Outgoing Chinese President Hu Jintao called for stepping up defense technology, declaring the military's most important task is to be able to "win a local war in an information age." Combined with China's yearlong brushes with Japan, the Philippines, and Vietnam over disputed island territories, such posturing signaled to the United States and its Pacific allies the need for aerospace systems capable of overcoming the "anti-access/area denial" capabilities China intends to field.

The most high profile of these is the Joint Strike Fighter (JSF). Five years after its first flight, an F-35A made its first night flight in January, a telling milestone for a program that has completed just 20 percent of its planned flight testing. With JSF procurement costs estimated at a minimum \$380 billion, the services are mulling how many of the desired 2,443 aircraft they can buy and what the type mix will be. International participants are as well. Japan's favorable late 2011 decision to buy 42 F-35s was somewhat offset by persistent rumors that Italy will

**Dassault's Rafale was selected as India's future Medium Multirole Combat Aircraft (MMRCA), with an initial order of 126. 108 of the 126 are to be built in India.**

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reduce its buy, possibly eliminating the F-35B purchases.

The lifting of “probation” on the short takeoff/vertical landing (STOVL) F-35B by Panetta in January was predicated on testing successes in 2011. The decision was cited by the U.K. Ministry of Defense (MoD) as a factor in its decision to reverse course in May, abandoning its switch to the F-35C carrier variant. More vital to the decision, however, were the greater-than-projected costs of redesigning Britain’s new Queen Elizabeth-class aircraft carriers and training U.K. pilots in conventional carrier flight operations. During handover ceremonies for the U.K.’s first F-35B in July, U.K. Defense Secretary Philip Hammond indicated the country would reduce its buy to 48 F-35Bs initially, with additional unit buys to be decided later.

As in the rest of Europe, Britain’s fiscal situation is uncertain, but the cost of the F-35 would be an issue regardless. Early year revelations of Chinese cybertheft of F-35 data play a role as well. Before detection in 2009, Chinese hackers actually sat in on secure online program progress conferences. The resulting loss of information forced redesign of critical equipment, contributing to program delays and further driving up cost. Broader data losses from a variety of U.S. military programs not only demonstrated the efficacy of foreign cyber intrusions but the resulting rise in cost of those programs and potential operational vulnerabilities.

U.S. Marine Corps F-35 initial operating capability (IOC) is slated for 2015 (IOC for the U.S. Air Force [USAF] and U.S. Navy [USN] is planned for 2018), making test program progress scoreboard-worthy. As of July, the fighter had conducted 595 test flights, ahead of its 445-flight schedule. By late fall, F-35s had executed the first aerial releases of the AIM-120 AMRAAM air-to-air missile and the GBU-31/BLU-109 JDAM bomb at the Navy’s China Lake test range. November saw the 500th combined F-35 sortie at Eglin Air Force Base (AFB), Fla., whose ramp was stocked with 22 F-35s. Later in the month the Marine Corps formally stood up its first (largely ornamental) F-35B squadron (VMFA-121)



**An F-35 during high angle of attack testing at Edwards AFB, Calif. The F-35 program is making significant progress, but questions still hang over the program.**

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at Marine Corps Air Station Yuma, Ariz.

While these signs of progress are encouraging, continued software problems with the aircraft’s Autonomic Logistics Information System, with the F-35’s advanced helmet (the aircraft has no head-up display), and other integrated pieces are preventing the Lightning II from gaining realistic combat capability. Added to these are concerns that herculean efforts to reduce the aircraft’s weight may lead to long-term structural problems, the seriousness of which will be unknown until operational use begins.

Lockheed Martin will largely have to use its own resources to correct the problems, as USAF then-Maj. Gen. (now Lt. Gen.) Christopher Bogdan, the incoming director of the F-35 program, told the annual Air Force Association conference in September:

“There is no more money and no more time on this program. We will not go back and ask for more, simple as that.”

Elsewhere across the fighter spectrum, the Boeing F-15 line looks set to remain open for most of the next decade finishing F-15SG and F-15K orders for Singapore and South Korea. Japan’s selection of the F-35 was regarded as dimming prospects for further F-15 Silent Eagle sales to South Korea. Finalization of a \$29.4 billion sale of 84 new F-15SAs and the update and refurbishment of 70 older F-15s for Saudi Arabia added to Boeing’s Eagle backlog. In July, the F-15 acquired more capability with successful weapons integration of the Joint Air-to-Surface Standoff Missile (JASSM), making it the sixth JASSM-ready platform.

Super Hornet production will continue through 2015, filling orders for the USN and Australia. The F-18E/F remains a competitor for fighter buys in Denmark, the United Arab Emirates (UAE), Brazil, and Malaysia. Growler production continues as well. The Next Generation Jammer (NGJ), which is to give the

EA-18G a leap in capability, is to be ready by 2020, provided by a single contractor. Four teams are competing to produce the jammer, which is increasingly being seen as enabling unmanned platforms rather than the F-35/F-18.

Lockheed and Boeing account for one-third of global fighter production and further F/A-18 and F-16 builds become more likely as the JSF program continues to bump along. In January, Iraq announced it would buy F-16s, followed by a November announcement that it would abandon a \$4.2 billion arms deal with Russia that included helicopters, air defense systems, and MiG-29M/M2 fighters. In March, Lockheed Martin delivered the 4,500th F-16 (a Block 52) to Morocco. October saw the company land a contract to upgrade 145 F-16A/Bs to F-16V configuration (including active electronically scanned array [AESA] radar, upgraded electronic warfare [EW] capability, and embedded GPS) for Taiwan. Ongoing refurbishment of USAF F-16s continues as well, but Congress has since blocked the plans.

In February, the U.S. Air Force announced plans to shut down six tactical aircraft squadrons with 123 fighters, including 102 A-10s and 21 F-16s. Sixty-five older C-130s and 27 C-5As seemed headed for the boneyard as well, but Congress has since blocked the plans.

Some of the savings would be used for upgrades, including AESA radar, for several aircraft types. Effective though scanned array radars are, in 2012 there was increasing concern about their vulnerability to cyberattack as Russian and Chinese makers design specific EW platforms to go after American E-8 Joint Surveillance Target Attack Radar System (JSTARS), RC-135 Rivet Joint, and P-8A maritime patrol assets. In response, the Air Force has accelerated work on the Advanced Tactical Data Link to retain operational capability, and is considering a possible shift to multiple lower-end manned ISR platforms like the Hawker Beechcraft King Air 350ER, various Gulfstream-based types, and even the Hawker Beechcraft G58 Baron.

The Dassault Rafale was selected as India's Medium Multirole Combat



**A MiG-29KUB during flight deck testing. The original Russian order for MiG-29s piggybacked the Indian navy's order for 16 aircraft, saving on start-up and development costs. The latest February 2012 order is for 20 MiG-29Ks and four MiG-29KUBs.**

Aircraft in February, giving the French fighter builder a lifeline. The month before, France had decreased its Rafale procurement to 11 units annually, inching to its 286 total. The 126-plane Indian order will see 18 Rafales built in France and the remainder built by Hindustan Aeronautics Limited (HAL) in India. Finalization of the contract remained ongoing at year's end, but no large hitches were expected, and there was even talk of a follow-up contract for an additional 63 aircraft.

India, meanwhile, continues with its diversified aircraft sourcing, from the Boeing P-8A to the Sukhoi PAK FA/T-50. The latter continued its test program, fitted with an AESA radar in August.

In October, India cut its order for the Russian fifth-generation fighter aircraft (FGFA) by one-third, now committing itself to 144 Indian-spec T-50s instead of 214. Their in-service debut is to be pushed back from 2017 to 2020 and they are all to be single-seaters. India's indigenous Tejas Light Combat Aircraft made its first test flight but suffered from too much weight and too little power. A stealthy Mk. 3 version may eventually operate from Indian aircraft carriers.

Russia is moving forward with its own carrier strike force. Twenty MiG-29Ks and four two-seat MiG-29KUBs have also been ordered to replace Su-33s on Russia's *Admiral Kuznetsov* aircraft carrier. Russia also ordered 92 Sukhoi Su-34 long-range fighter/bombers for its air force, with deliveries to begin in 2015. At \$3.4 billion, the March order was the largest placed by Russia's MoD since the Soviet era, bringing the total number of improved Su-34s procured to 124. In November, Russian media surprisingly expressed mild disapproval of a \$1.5 billion preliminary agreement

to deliver 24 Sukhoi Su-35BMs to the Chinese air force, questioning whether the contract was worth the inevitable technology transfer to China.

As the year opened, the Eurofighter partners decided to slow production of Tranche 3A aircraft to extend work to 2017. No Tranche 3B orders have been placed, and without further export sales the batch is unlikely to be produced. Allegations of bribery by EADS in connection with Austria's 18-unit Typhoon buy threatened contract termination in November. Cancellation of the contract would further diminish bleak sales prospects for the Eurofighter.

In May, Lockheed Martin delivered the 195th and final F-22 Raptor, ending a production run that began in 1997. The USAF fleet of 188 operational Raptors was diminished by one with the November crash of an F-22 at Tyndall AFB, Fla.

The Raptor's much publicized oxygen system problems resulted from a faulty valve, the Air Force concluded. Early in the year it began retrofitting aircraft

with an automatic backup oxygen supply system provided by Lockheed Martin.

Despite its current entanglements, the Air Force has already begun discussing what its next fighter (F/A-XX) should be, optimistically forecasting operations by 2030-35. Discussion of a next-generation Long Range Strike bomber has picked up with the strategic pivot, but the "what," "when," and "how we fund it" questions haven't been seriously addressed.

In November, an Iranian aircraft fired on a U.S. Predator unmanned aerial vehicle (UAV) conducting surveillance in international waters. The Predator wasn't hit, but the incident capped a year-long shift in thinking about unmanned systems. Turning its attention from irregular threats like those in Afghanistan, the Air Force increasingly believes that limited numbers of unmanned vehicles with highly sophisticated ISR capabilities are vulnerable to peer/near-peer air and cyberattacks. A large number of smaller, less capable but networked UAVs could absorb losses and continue the mission.

The logic was evident in the Air Force's attempt to axe its Global Hawk Block 30 UAVs, a move blocked by Congress. Northrop Grumman did succeed in selling five Global Hawk Block 40s to NATO in May as the Alliance sought to address the dearth of ground surveillance assets it experienced during the Libyan campaign. South Korea was seen as another Global Hawk (RQ-4A) customer, along with Japan, which is also interested in the Broad Area Maritime Surveillance (BAMS) MQ-4C variant. Australia may acquire up to eight of the MQ-4Cs. The loss of a BAMS demonstrator in June did not deter Northrop Grumman and the U.S. Navy from rolling out the first MQ-4C Triton later that month. Two were in ground testing as of November.

The global unmanned air system market is estimated at \$42.4 billion. It's currently dominated by General Atomics' Predator family (58 percent) and Northrop Grumman's Global Hawk. North America and Europe are the biggest customers, but Asian sales are expected to rise through 2020 while Western orders level off. American manufacturers are chafing at U.S. technology restrictions that hamper export; foreign sales have accounted for just 5 to 7 percent of backbone UAV systems like the Predator/Reaper, RQ-7 Shadow 200, and RQ-11 Raven in the past several years. Slow adoption of UAV systems by foreign militaries accounts for some of the sluggishness.

Nevertheless, Italy became the second foreign customer after the U.K. to field armed UAVs, with the purchases of Predator and Reaper vehicles (six of each) in June. They're expected to deploy in early 2013. In May, Northrop Grumman's X-47B carrier-borne unmanned combat air system-development (UCAS-D) underwent electromagnetic energy pulse testing in preparation for firing anti-electronics/high-power microwave weapons at close range. An X-47B flew from Naval Air Station (NAS)

**A Moroccan F-16 in flight in 2010. Lockheed Martin delivered its 4,500th F-16, a Moroccan Block 52, in March 2012.**

PHOTO BY DAVID DRAIS



Patuxent River, Md., over the summer in preparation for carrier trials in 2013. In November, the Navy completed the first shore-based trials of a wireless handheld device that will enable operators to maneuver the X-47B on carrier decks, and in December, an X-47B embarked on the aircraft carrier *Harry S. Truman* for further deck-handling trials, while another made the type's first catapult launch from NAS Patuxent River.

Historic operations of unmanned Kaman K-MAX helicopters in aerial resupply missions in Afghanistan started in January and will continue into 2013. Boeing's H-6U Little Bird rotorcraft completed autonomous landings and takeoffs from a ship in preparation for a French navy demonstration. Along with Italy, Sweden, Switzerland, Spain, and Greece, France is jointly developing the Dassault Neuron UCAV (unmanned combat air vehicle) demonstrator, which was to make its first flight in November. The U.K. is proceeding with a contract for a future combat UAV with BAE Systems and is expected to fly its Taranis UCAV in 2013.

India has its own stealthy UCAV program taking shape, and in November, Pakistan revealed that it was on the cusp of fielding an unnamed strike UAV. Sukhoi will focus on creating reconnaissance and strike UAVs for Russia in the near future with a series of unmanned craft known as "Zond," which are to be optimized for surveillance. Sukhoi is already developing a 20-ton strike UAV with RAC MiG. And while the USAF cancelled its persistent surveillance Blue Devil airship (Mav6) in May, the U.S. Army is pressing on with its airship, Northrop Grumman's Long Endurance Multi-Intelligence Vehicle (LEMV), which made its first flight in August.

In January, Hawker Beechcraft received news that Mexico would buy six of its T-6C+ trainers to replace aging PC-7s. The Joint Primary Aircraft Training System program for which the T-6 is produced is winding down, with the USN slated to get 137 T-6Bs through 2015. China's Hongdu K-8 is forecast to garner as much as a third of the world

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jet trainer market in the coming decade, with the Alenia Aermacchi M-346, KAI T-50, BAE Systems Hawk, and Yakovlev Yak-130 dividing the rest.

Saudi Arabia earmarked \$2.51 billion in May for 22 BAE Hawk advanced trainers and 55 Pilatus PC-21 basic trainers, while India approved a \$700 million contract for 75 Pilatus PC-7 basic trainers to bridge the gap until its own HAL Sitara trainer reaches operating capability. Alenia's M-346 clinched a 30-unit, \$1 billion buy from Israel in July. Singapore is buying the M-346 as well, with first delivery by the end of 2012. The M-346 beat out Korean Aerospace's T-50 for both deals and is well positioned to compete for the USAF's 350-unit T-X T-38 replacement program.

The Air Force terminated its C-27J buy, which received no funding in the administration's 2013 budget, but Congress once again stepped in, mandating that the Air Force retain 32 "medium-lift aircraft." However, the medium-lift aircraft could also

be C-130s. As of early 2012, 13 of the contracted 38 aircraft had been delivered. Boeing C-17 production will end in 2014 unless further export sales are made, ending strategic airlifter production in the United States, though medium airlift C-130 production will continue. In February, Lockheed unveiled its C-130XJ concept for international customers requiring less expensive small fleet/special mission airlifters with less content (deleted advanced communications/defensive systems). A C-130NG (Next Generation) could be a reality by decade's end. Saudi Arabia was close to signing a \$6.5 billion deal with Lockheed for 20 C-130J-30s and five KC-130J tankers as the year closed.

In May, the Airbus A400M was still experiencing minor TP400D engine problems, though Airbus maintained it would deliver the first-production aircraft to the French air force in 2012. By year's end, delivery had shifted to the second quarter of 2013. A400M orders stood at 174 by the end of 2012, and it is to be operational in 2014.

The USN stood up its carrier onboard delivery aircraft replacement program in October. Northrop Grumman is pitting remanufactured C-2A Greyhounds against Bell Boeing's V-22. The C-2 could offer fleet efficiencies with the E-2D while the V-22 can leverage a similar advantage plus operate from smaller ships. Boeing also announced a teaming arrangement with Embraer to market the Brazilian maker's KC-390 lifter in June.

Boeing commenced building its first batch of AH-64D Apache Block III attack helicopters in January, integrating more powerful engines and new rotors. The Block III Apache – officially designated the AH-64E in October, and named "Guardian" in January – is the only aircraft that facilitates pilot interoperability/control of unmanned air systems. Lean times are forecast for the U.S. and other tactical helicopter markets, exemplified by doubts the U.S. Army can afford to fund a new armed scout/reconnaissance helicopter and will soldier on with the OH-58D Kiowa Warrior. Armed scout competitors range from the EADS UH-72 and AgustaWestland



**In early November, Northrop Grumman and the U.S. Navy successfully completed shore-based trials of a new wireless, hand-held device that would allow deck operators to maneuver the X-47B unmanned aircraft by remote control on the carrier deck. The tests were conducted at Naval Air Station Patuxent River, Md. The operation of the new control device was validated in an actual carrier environment in January 2013.**

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AW119/AB109 to the Boeing AH-6 and Bell's own Kiowa Block II.

The AH-1Z/UH-1Y, CH-47F, UH-60M, and MH-60R/S programs continue in full-rate production, with Sikorsky having inked an \$8.5 billion, five-year deal to build 653 Black Hawk/Seahawk helos for the Army and Navy by 2017. An additional 263 aircraft may be optioned. Northrop Grumman and AgustaWestland will team to respond to anticipated requests for the USAF combat rescue helicopter replacement and new presidential "Marine One" with U.S.-built versions of the AW101.

Like many manufacturers, Bell is looking to the export market to keep its lines open. It showed the V-22 at the Dubai Air Show in November to several prospects including the UAE. China Aviation Industry Corporation (AVIC) used the Zhuhai Air Show to show off its WZ-10 "Thunder Fire" attack helicopter and WZ-19 "Black Tornado" armed reconnaissance helo to potential customers.

After spending more than \$5 billion in 16 years of development, the Pentagon ditched the Airborne Laser (ABL) ballistic missile killer (747-400F) in December 2011 in favor of pursuing smaller directed-energy payloads fielded on high-flying unmanned aircraft. ABL program cancellation is a loss to Boeing, though the company retains its role as manager of the massive Ground-based Midcourse Defense system for the U.S. Missile Defense Agency.

The shift in emphasis in missile defense did not detract from Lockheed Martin's successful October test of its Command, Control, Battle Management

and Communications (C2BMC) system. C2BMC performed the first-ever coordinated ballistic missile defense against three targets, simultaneously engaging Aegis Ballistic Missile Defense, Patriot Advanced Capability-3, and Terminal High Altitude Area Defense systems. The coordinated defense negated two ballistic missile targets and one cruise missile target.

As with other platforms, the USAF is hoping that a larger number of smaller, simpler satellites can take over mainstream Air Force missions by the middle of the next decade, possibly with the next-generation space situational awareness and weather satellites. Multiple satellite platforms separate capabilities, drive down cost per satellite, and present adversaries with more complex targeting problems.

Finally, a proposed merger of EADS and BAE failed due to Germany, France, and Britain's failure to come to terms on the level of state involvement in the post-merger company. The rejection was seen as a missed opportunity for Europe's shrinking aerospace sector. ■