

AEROTECH NEWS



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and Review

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Photographs by John Battey

The U.S. Navy Blue Angels' (inset) were one of the many highlights of the 2008 San Francisco Fleet Week Air Show during the Columbus Day weekend. Also on hand was the V-22 Osprey (main) and the Canadian Forces Snowbirds, among others. For more on the air show, see Page 14.

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Russia modernizes missiles in response to U.S. plans

Russia's efforts to upgrade its missile arsenals will help counter the planned U.S. missile defense sites in Europe, a top general said Oct. 22.

Russia's Strategic Missile Force chief, Col.-Gen. Nikolai Solovtsov, said the military will commission a new type of intercontinental ballistic missile and modify the existing missiles.

Solovtsov said that the new RS-24 missile equipped with multiple nuclear warheads will enter service next year.

"Its deployment will increase the Strategic Missile Forces' capability to penetrate missile defense systems, thus strengthening the nuclear deterrent potential of Russian strategic forces," he said in a statement carried by Russian news agencies.

Solovtsov said the military conducted two test launches of the RS-24 last year and will make another one before the year's end. Russian officials have said it would gradually replace Soviet-built ballistic missiles.

Russia has denounced a U.S. plan to deploy a battery of 10 missile interceptors in Poland and a related missile defense radar in the Czech Republic, saying it threatened Russian security. It has dismissed the U.S. claim that the sites were intended to counter a prospective missile threat from Iran and was not aimed against Russia.

Russian officials have threatened to point nuclear missiles at the countries that will allow U.S. missile defense sites on their territory.

He said the military will maintain the Soviet-built missiles, including those that were manufactured in Ukraine. "We have agreements with Ukraine that would allow us to maintain their capability," Solovtsov said. *AP*

Jane's identifies key emerging defense markets

Arms manufacturers will have to seek new markets as the economic crisis and changing priorities curb military spending in the U.S. and Europe, analyst Jane's Information Group said Oct. 21.

The United States accounts for nearly half the world's defense spending, but Jane's predicts U.S. expenditure will fall in the next few years, while military spending in Europe remains flat.

The publication Jane's Industry Quarterly identified Australia, South Korea, Saudi Arabia, Taiwan and Brazil as the most attractive

"golden markets" for defense companies. Jane's chose those markets for a combination of growth rate, market size, stability and openness to international defense firms.

Editor Guy Anderson said military spending in parts of Asia, the Middle East, South America and Oceania was rising because of "growing prosperity combined with an increasingly volatile local or regional security environment."

"Economic turmoil, changing priorities and rising costs are having a severe impact on defense budgets across Europe and the United States, and this is leading defense companies to need to look to new frontiers to maintain growth," Anderson said.

Jane's predicts the U.S. defense budget will fall by \$75.9 billion to \$620 billion by 2010. Military spending in the 27 EU states is expected to rise 2 percent to \$297 billion.

After the United States, the world's biggest spenders on defense are Britain, France, China and Japan. *AP*

Air Force delays \$15 billion rescue helicopter program

The Air Force is delaying the award of a disputed \$15 billion helicopter contract until next year.

The military service said Oct. 22 it needs more time to pick a contractor to replace a fleet of 141 aging combat search-and-rescue helicopters used to scoop up troops often stuck behind enemy lines.

Boeing won the initial contract, but the program has been on hold for two years after Lockheed Martin and United Technologies's Sikorsky Aircraft challenged the deal. The Government Accountability Office backed the losing bidders' protests, and called on the Air Force to reopen the competition.

The Air Force had planned to make a new award by December, but has notified the bidders it will be seeking more information from each before making a decision.

When informed of the Air Force's decision, Paul Jackson, a spokesman for Stratford, Conn.-based Sikorsky, lauded the service's move to take additional time to make a selection. Representatives from Boeing and Lockheed Martin had no immediate comment Oct. 22.

The program has a tortured history, including the protests, several delays and an ongoing probe by the Pentagon inspector general's office over whether an earlier attempt to award the contract favored

Boeing.

The helicopter contract setback is the third large Air Force deal delayed in recent months, following a \$35 billion contract for refueling planes and a spy satellite program worth roughly \$6 billion. *AP*

Navy cancels combat ship contract; plans three more

The Navy has canceled plans to buy a third new combat ship this year from either Lockheed Martin or General Dynamics, citing budget shortfalls.

Both companies have been waiting since April for a decision from the Navy on that deal and another order for two more ships. The service last year canceled deals with both Lockheed and General Dynamics for second ships from each due to cost overruns. The Navy's latest cost estimate for the current ships being built is \$550 million per vessel.

But with a decision by Congress to cut funding for a third planned ship in fiscal 2008, the Navy is trying to stabilize the program while maintaining affordable pricing through competition.

The Littoral combat ship is smaller than the Navy's next-generation surface combat ship and capable of operating in shallow, coastal waters that can move at "sprint speed" to get Marines safely out of enemy territory. The LCS can travel at 57.5 miles per hour - compared with the average speed of 34.5 mph for other combat ships.

The Navy now plans to award one ship to each contractor under the fiscal 2009 budget, and hold a competition for another three vessels with funding in fiscal 2010 to keep competitive pressure between the two companies. Each of the 2009 contracts will come with options for future ships.

However, the Navy said it will evaluate pricing of the fiscal 2010 ships before making a decision, and envisions awarding two ships to a winning contractor and one ship to a losing bidder, the same as its original plan.

A contract for the next set of ships is expected to be awarded early next year. *AP*

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Lockheed profit up two percent, helped by IT unit

by Stephen Manning
Associated Press

Lockheed Martin's third-quarter earnings rose 2 percent, helped by a one-time gain and higher profit margins that offset lower sales of fighter jets, but its outlook for next year fell well short of Wall Street expectations.

Lockheed Martin raised its 2008 outlook, but said that 2009 will be hurt by expected higher pension expenses stemming from recent turbulence in the financial markets. That volatility has significantly cut the value of Lockheed's pension plan.

Shares of the Bethesda, Md.,-based

company fell \$6.44, or 7 percent, to \$86.78, in morning trading.

Lockheed Martin's third-quarter earnings totaled \$782 million, or \$1.92 per share, including a gain of \$44 million from the sale of a rocket launch business. A year earlier, the company earned \$766 million, or \$1.80 per share.

But overall revenue dropped about 4.5 percent to \$10.58 billion. Leading the decline was the company's aeronautics division, which makes fighter jets and other military planes. Sales fell 13 percent to \$2.9 billion, the effect of a planned shift from making older F-16 fighter planes to the new F-35 jet.

The company raised its outlook for the year by 10 cents to between \$7.55 to \$7.70 per share on sales in a range of \$41.9 billion to \$42.9 billion. The increase is based largely on an expected pick up in sales of the F-35.

But its 2009 forecast of \$7.65 to \$7.90 per share in earnings fell short of the \$8.39 consensus forecast of analysts.

Lockheed and the rest of the defense industry have posted record profits in recent years behind heavy Pentagon spending on two wars and big programs for military equipment. But many analysts believe military spending will wane with a new president in office and the government pouring bil-

lions of dollars into propping up the ailing economy.

Bruce Tanner, the company's chief financial officer, said in an interview that Lockheed Martin will face a significant headwind next year for pension expense. This year, adjustments for pensions are expected to lead to a \$125 million benefit to income, while in 2009 it will be a \$60 million reduction in income. The \$185 million swing between the two years totals about 30 cents per share in earnings, he said.

The lower results are due to the recent volatility in the financial markets, which has hurt the pension plans of many defense contractors.

In the third quarter, Lockheed's

unit that makes information technology systems was the only of its four business divisions to post a sales gain, rising 9 percent to \$2.95 billion. The segment provides IT work ranging from battlefield communications to record management for government and private industries.

Tanner said that despite the lower sales, Lockheed was able to increase profit margins in all but the aeronautics division. He attributed it to "rock solid operating performance" that helped the company post higher quarterly earnings despite the lower sales figures.

"Operationally, we couldn't ask for much better results," he said.

Boeing's third quarter profit dives 38 percent

by Daniel Lovering
Associated Press

Boeing, the world's No. 2 commercial airplane maker, said Oct. 22 its third-quarter earnings plummeted 38 percent as a strike and supplier production problems hurt results. Its shares fell nearly 5 percent in morning trading.

The Chicago-based aerospace company said it earned \$695 million, or 96 cents per share in the quarter, down from \$1.11 billion, or \$1.44 per share, a year earlier. The strike and production problems reduced Boeing's airplane deliveries, cutting profit by 60 cents per share during the period.

Quarterly revenue dipped 7 percent to \$15.29 billion.

Analysts polled by Thomson Reuters, on av-

erage, expected earnings per share of 98 cents on revenue of \$14.61 billion. Analyst estimates typically exclude one-time items.

Boeing shut down its commercial aircraft production facilities in September when about 27,000 workers from its Machinists' union went on strike after talks over a new labor contract failed.

Delivery of some aircraft was delayed by the strike and problems getting galleys from suppliers for certain wide-body planes.

Without the strike, Boeing would have delivered 119 planes during the quarter, but ended up with a total of 84 deliveries, or 35 fewer than planned.

Boeing said it will provide updated financial guidance and information about the schedule for its affected airplanes after the strike ends.

"While the suspension of commercial airplane deliveries had a major impact on the quarter, we effectively executed the remainder of our business and kept our focus on the strong balance sheet we have built over the past few years," Jim McNerney Boeing's chairman, president and chief executive, said in a statement.

Demand for new, fuel-efficient commercial planes remains strong and exceeds supply, the company said.

Boeing's new 787 passenger jet, which has been hampered by lengthy production delays, has been touted for its promise of greater fuel efficiency due to its construction from lightweight carbon-fiber composite parts.

Work on the plane progressed during the quarter, Boeing said, with a successful hydraulic sys-

tem test, landing gear test and pressurization test of the static airframe. The company also began testing the flight controls and started final assembly of its fourth flight-test plane. Fifty-eight customers have ordered 895 of the planes to date.

Boeing said it may need to finance some airplane deliveries beginning in 2009, the first such financing since 2006, but declined to specify the deliveries.

Boeing has made backstop financing commitments for 3 percent of its commercial airplane backlog, mostly for 787s, related to deliveries through the end of the next decade, the companies said.

Northrop Grumman third quarter profit rises 4.7 percent

by Donna Borak
Associated Press

Northrop Grumman on Oct. 22 said higher sales of surveillance systems helped boost its third-quarter profit 4.7 percent and spurred the defense contractor to raise its 2008 earnings forecast.

The Los Angeles-based company reported net income of \$512 million, or \$1.51 per share, in the quarter ending Sept. 30, up from \$489 million, or \$1.41 per share, a year earlier. The prior year's quarter included an after-tax gain of \$21 million, or 6 cents per share, for a reorganization.

Northrop, which makes military aircraft, defense electronics and amphibious assault ships, said its revenue rose more than 6 percent to \$8.38 billion, led by double-digit growth in its electronics segment.

Excluding discontinued operations, the company earned \$1.50 per share.

The latest results beat Wall Street forecasts for adjusted profit of \$1.42 per share on revenue of \$8.19 billion, according to a Thomson Reuters poll.

Northrop raised its outlook for 2008 to a range of \$5.10 to \$5.20 per share — compared with its previous estimate of \$4.90 to \$5.15 per share. The figures are in line with analysts' average expectations of \$5.13 per share, according to a Thomson Reuters survey.

The company received \$11.5 billion in new business orders in the quarter. As of June 30, Northrop's total backlog reached a record \$70.1 billion.

Sales from its four business segments improved during the quarter except for Northrop's shipbuilding division, which declined 1.2 percent to \$1.45 billion.

Dryden awards L-3 Communications Global Hawk support contract

by Raphael Jaffe
staff writer

NASA's Dryden Flight Research Center, Edwards, Calif., has awarded a multi-year contract to L-3 Communications Corporation's Communications Systems West of Salt Lake City for engineering, technical and product support services in support of the center's pending operation of two Global Hawk aircraft.

The award was announced Oct. 10.

The indefinite-delivery, indefinite-quantity, contract is for a five-year period with a value not to exceed \$15 million. The agreement covers the period from Sept. 5, 2008, through Sept. 4, 2013.

The contract supports Dryden's planned operation of the two aircraft, their associated ground control station and related systems. L-3 Communications will be responsible for providing specialized analysis, engineering, functional tests, hardware or software development or testing that requires specific L-3 Communications proprietary data.

The contractor's efforts will include re-manufacturing components or equipment and specific operational support related to pre-flight preparation, mission, flight and post-flight support. Mark Dickerson, Dryden project manager, calls this important work. L-3's Communications Systems West will also be responsible for supporting deployments of the aircraft to other NASA or customer facilities, domestic or foreign operational deployment location.

Dryden will use the autonomously operated unmanned aircraft for missions supporting NASA's Science Mission Directorate and the Earth science community that need high-altitude, long-endurance, long-distance airborne capability. The Science Mission Directorate has teamed with the National Oceanic and Atmospheric Administration and the Department of Energy to investigate unmanned aircraft systems, specifically the Global Hawk, for Earth observation research. The first science mission using the Global Hawk is tentative scheduled for the spring 2009. When a portable ground control station is developed, deployments and missions will be possible worldwide.

Previously, Dryden awarded a multi-year contract to Northrop Grumman Integrated Systems Division for engineering and tech-



NASA photograph by Tony Landis

nical services in support of the center's planned operation of the two Global Hawks. That indefinite-delivery, indefinite-quantity, sole-source contract is for a five-year period with a value not to exceed \$25 million. The agreement covers the period from Aug. 6, 2008, through Aug. 5, 2013.

That contract supports Dryden's planned operation of the two aircraft, their associated ground control station and related systems. Technical assistance will include analysis, design support for unique systems, simulations, software development and engineering, and operational and manufacturing support as needed.

Evidently, this is in addition to the Space Act Agreement signed in May, to cooperatively conduct Global Hawk missions. NASA and Northrop Grumman will share use of the ground control station, maintenance facilities, and the two NASA Global Hawk aircraft.

Dryden received two Global Hawks in September 2007, when the Air Force had no further requirement for the two Advanced Concept Technology Demonstration pre-production aircraft, AC-1 and AC-6.

See DRYDEN, Page 4

General Dynamics third quarter profit up 16 percent

by Stephen Manning
Associated Press

Defense contractor General Dynamics said Oct. 22 its third-quarter earnings rose 16 percent on higher sales in its shipbuilding unit and information technology business, topping Wall Street's earnings forecast.

The company also raised its 2008 outlook. The Falls Church, Va.,-based company earned \$634 million, or \$1.59 per share, for the quarter, up from \$546 million, or \$1.34 per share, a year earlier. It had \$7.14 billion in sales, a 4.5 percent increase from \$6.83 billion a year ago.

Analysts polled by Thomson Reuters were expecting \$1.51 per share in earnings on higher

revenue of \$7.37 billion.

The company saw sales growth in three of its four businesses, led by a nearly 13 percent jump - to \$1.4 billion - in its marine division that makes warships for the Navy and submarines. Sales in the company's information technology division gained nearly 5 percent to \$2.5 billion, while the Gulfstream private jet unit saw sales rise about 4 percent to \$1.37 billion.

However, sales in the combat systems division, which makes tanks, armored vehicles and other equipment, dipped slightly to \$1.85 billion. General Dynamics has benefited greatly in recent quarters from Army and Marine Corps demand for heavily armored vehicles that can withstand roadside bomb blasts. But the program is in the

process of winding down.

Analyst Cai von Rumohr of Cowen and Co. said the shortfall in combat sales was "puzzling," but added that "investors should be positive on strong third quarter results."

The company said it increased its backlog of orders to \$60.5 billion in the quarter, from \$55.3 billion at the end of the second quarter. Much of the growth came from equipment such as Stryker infantry combat vehicles, work on upgrading Abrams tanks and new orders for Gulfstream business jets.

General Dynamics has boosted its Gulfstream business in the past year as demand for private jets grew worldwide. In March, it unveiled a long-range, wider-body jet called the G650, and in Au-

gust announced plans to buy Swiss jet servicing company Jet Aviation for \$2.25 billion.

Company CEO Nicholas Chabreja said he expected Gulfstream would stay healthy despite the locked up credit markets. He said orders for larger planes like the G650 that are frequently bought for cash could make up for a drop in demand for smaller jets that are often bought with financing.

The company also raised its 2008 guidance to \$6.10 per share, up from its previous prediction of \$6.00 to \$6.05 per share in July. Analysts expect General Dynamics to earn \$6.13 per share for the year on \$29.7 billion in revenue.

"This backlog, the productivity of our businesses and a powerful balance sheet leaves us in great shape," Chabreja said.

DRYDEN, from 3

The ability of the Global Hawk to autonomously fly long distances, remain aloft for extended periods of time, and carry large payloads brings a new capability to the science community for measuring, monitoring and observing remote locations of Earth not feasible or practical with piloted aircraft, most other robotic or remotely operated aircraft or space satellites.

The aircraft's 11,000-nautical-mile range and 30-hour endurance, together with satellite and line-of-site communication links to the ground control station, allow for eventual worldwide operation. Dedicated satellite communication links will provide researchers with direct access to their onboard instrument packages during missions. Researchers will have the ability to monitor instrument function from the ground control station and evaluate selected data in real time.

The 44-foot long Global Hawk has a wingspan of more than 116 feet, a height of 15 feet, and a gross takeoff weight of 25,600 pounds, including a 2,000-pound payload capability. A single Rolls-Royce AE3007H turbofan engine powers the aircraft. The distinctive V-tail, engine cover, aft fuselage and wing are con-

structed of graphite composite materials. The center fuselage is constructed of conventional aluminum, while various fairings and radomes feature fiberglass composite construction.

The Global Hawk Integrated Communications System was developed by L-3. It is a multi-link wideband communication system designed for airborne vehicles. The ICS provides a Common Data Link compatible, full duplex wideband air-to-ground data link, a full duplex wideband satellite data link, and redundant full duplex UHF satellite and/or Line-of-Sight links for command/control. The ICS consists of a Common Airborne Modem Assembly, a SATCOM Radio Frequency Assembly (RFA), a High Voltage Power Supply, a High Power Amplifier, a SATCOM antenna, a LOS RFA, a LOS dual-band antenna, two UHF Receiver/Transmitters, two UHF Power Amplifiers, two LNA/Diplexers, and two UHF antennas. When paired with L-3's surface terminals and satellite terminals, the ICS provides the complete communications package for line-of-sight and satellite communications for an airborne vehicle.



NASA photograph by Tony Landis

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Flight Test Associates completes Citation flight test program

by Alan Radecki
special to Aerotech News

Flight Test Associates of Mojave, Calif., has completed a Cessna Citation re-engining flight test program for Clifford Development Group.

Clifford is acquiring FAA Supplemental Type Certificates to re-engine Cessna II and SII Citations with Williams FJ44-3A engines, replacing the aircraft's original Pratt & Whitney JT-15 turbofans.

According to Bruce Wilcox, Chief Operations Officer for Clifford, installation of the FJ44s results in a thrust increase of 300 pounds and up to a 27 percent fuel burn reduction. The re-engining package rebuilds and strengthens the engine pylon structure

and replaces Cessna's original engine control cables with a FADEC system. The new engines allow the aircraft to be certified to Stage 4 noise criteria.

Flight Test Associates was selected by Clifford to perform the flight test collection and analysis required by the FAA for STC approval. The Clifford program involved two aircraft, a Model 550 Citation II and a Model S550 Citation II/S, which together flew about 80 flight hours.

Great Lakes Aviation of Kalamazoo, Michigan, will perform the conversions, and with the awarding of the FAA STC imminent, work has already begun on the first customer's aircraft. Dan Buzz of Great Lakes stated that there is a potential market for over 800 conversions.



BicycleWorks awarded research, development contract

Calspan's newest Operating Group, BicycleWorks located in Mojave, Calif., was officially notified Aug. 29 of their first substantial Contract Award for research and development support involving flight test.

As a Subcontractor to Wyle Laboratories, BicycleWorks will conduct the Aviation Test Program Technical Area Task as a part of the Reliability Information Analysis Center contract. This time and materials program encompasses an operating period of 36 months and has an initial price ceiling

of \$10 million.

Under the terms of the Subcontract BicycleWorks will use an Air Force F-16 and support equipment in direct support of the Navy (including Naval Sea Systems Command and Naval Air Warfare Center-Weapons Division) for Airborne R&D test and evaluation activities. Specific program activity will include, but not be limited to systems testing, aircraft chase, training, and sub-scale target presentations both subsonic and supersonic. Additionally, systems engineering,

design, development, implementation, test, reliability analysis and reports are an integral part of the work scope.

Paul Nafziger, Head of the BicycleWorks Group, notes that while this program constitutes a significant entry into the research, development, flight test and evaluation support market place, with superior program execution and continued Calspan BicycleWorks name branding, this is just a first step on a long and extremely successful journey.

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New Joint Cargo Aircraft seen at Mojave

by **Raphael Jaffe**
staff writer

A current Distinguished Visitor to Mojave Air & Space Port is the prototype C-27J Spartan Joint Cargo Aircraft.

It is basing at Mojave, Calif., while in a test program using the Naval Air Station China Lake airspace.

The aircraft was delivered on Sept. 25 to the Army and Air Force at Waco, Texas. L-3 Communications is the prime contractor for the U.S. Army and Air Force Joint Cargo Aircraft program. The first C-27J JCA was delivered to the joint program office on schedule and on budget. The aircraft is the first of 78 planned to be delivered to the Department of Defense. The current contract is valued in excess of \$2 billion.

The C-27J Spartan was selected in June 2007 as the Joint Cargo Aircraft. The first aircraft arrived at L-3's Waco facility Aug. 14 from Alenia Aeronautica's Caselle final assembly plant in Turin, Italy, to receive unique modifications and testing. The second JCA is currently undergoing testing in Italy and will arrive in Waco in October to be delivered to the customer in November.

The Mojave C27J personnel are a joint L3 and Alenia crew. Jim Budney is L-3 Program Manager for the Joint Cargo Aircraft program.

"The aircraft is performing very well thus far in the testing program," said Budney.

The JCA is designed for the last tacti-



cal mile of cargo needs. It carries time sensitive, mission critical supplies. One advantage of the C-27J is its short, rough field, landing distance of only 1,200 feet, along with a 2,000 feet take-off distance.

In technical terms, the C-27J is a mid-range, multifunctional and interoperable aircraft able to perform logistical re-supply, MEDEVAC, troop movement, air-drop operations, humanitarian assistance

and homeland security missions for the U.S. Army and Air Force. The C-27J will replace the Army's C-23 Sherpa and portions of the Army's C-12 and C-26 fleet. The C-27J will augment the Air Force's existing fleet of intra-theater airlifters. The aircraft will play a key role in providing responsive aerial sustainment and critical re-supply support for the maneuver force to maintain operational momentum.

There are impressive performance figures. It can carry 68 troops or 46 paratroops. For a medevac mission, there can be 36 stretchers plus 6 attendants. Load capacity is about 25,000 pounds. The C-27J resembles a shortened, two-engine version of the C-130J, and initial designs were in fact based on that aircraft by Lockheed Martin. Engines and propellers are identical to the C-130J units, as are much of the flight systems.

Finmeccanica completes DRS buy

Finmeccanica SpA, Italy's aerospace and defense giant, said Oct. 22 it had completed its acquisition of U.S. military contractor DRS Technologies Inc. in a \$5.2 billion deal.

The acquisition received all the required regulatory approvals as well as the go-ahead by DRS shareholders, Finmeccanica said in a statement. Under the deal, the Italian company purchased all DRS shares for US\$81 each in cash and took on approximately \$1.6 billion in debt.

DRS will operate as a U.S. subsidiary of Finmeccanica under agreements with the Defense Department.

Rome-based Finmeccanica is seeking to boost its international role as a key supplier of defense and security systems, while DRS hopes the new company will be able to bid for large-scale projects in the U.S. and abroad.

"The acquisition of DRS further solidifies our position as a top-tier international competitor and reinforces our commitment to the U.S. market, industrial base and, most importantly, the American armed forces," said Finmeccanica chairman and chief executive Pier Francesco Guarguaglini.

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UAS volunteers sought for Air Force test program

by **MSGt. Russell P. Petcoff**
Air Force News

Air Force officials are seeking up to 20 captains with four to six years of experience to volunteer for the unmanned aircraft systems beta test program.

"This first run of the test-run program is open to captains who have no previous military pilot-training experience," said Col. Curt Sheldon, assistant to the director of air operations for UAS issues, A-30-A. The colonel indicated the volunteer can have civilian pilot experience but may not have attended any portion of military pilot training.

Volunteers face an Oct. 31 deadline for completing the Test of Basic Aviation Skills, or TBAS, and a Nov. 3 application deadline.

Officials are seeking volunteers for the beta test program.

"We're looking for highly motivated individuals who are ready to contribute to the joint fight as UAS operators," Sheldon said.

Volunteers who successfully complete the program will eventually fly the MQ-1 Predator. These UAS operators will be the final link in the delivery of air power in the war on terrorism, according to Colonel Sheldon. Predators are armed with AGM-114 Hellfire missiles.

The combat contributions of UAS in today's fight have surpassed all expectations and have become a critical part of our ongoing successes in both Operation Iraqi Freedom and Operation Enduring Freedom, Sheldon said.

The beta test program will have two classes of 10 students each, according to the colonel. The first one starts in January 2009 and the second begins in the April timeframe. Each class lasts approximately eight months.

Eligibility requirements for volunteering for the program are:

- A captain with four to six years of total active federal commissioned service as of Jan. 1, 2009;
 - Be less than 30 years old by Jan. 1, 2009;
 - Complete the Air Force Officer Qualification Test with a minimum score for pilot greater than 25, and combined pilot/navigator composites of greater than 50;
 - Have two years time on station by July 1, 2009;
 - No previous military pilot training experience or undergraduate pilot training; and
 - Meet the contact lens requirement at time of physical examination at Brooks City Base, Texas, at <http://airforcemedicine.afms.mil/IFC1-MFS>
- Captains meeting the eligibility re-

quirements and who have completed their TBAS also will need a letter of recommendation from their group commander or equivalent. The submitted recommendation letter must be in a .pdf format. The recommendation must include the full name, rank and Social Security number of the applicant. Volunteers must e-mail their application package by 4 p.m. Central Standard Time Nov. 3 to specially-

ingprograms@randolph.af.mil.

Accepted volunteers will undergo a UAS operator-specific medical examination at Brooks approximately Nov. 17. For this examination, volunteers must not wear soft contact lens within 30 days of the examination nor hard lens within 90 days. The volunteer also must not have undergone refractive surgery within a year. In addition, volunteers must apply for

a Top Secret clearance.

The training will include introductory flight training at Pueblo, Colo. Next is a UAS fundamentals course at Randolph AFB, Texas; the Joint Air-to-Ground Operations School at Nellis AFB, Nev; and then UAS training at Creech AFB, Nev.

Unit military personnel flights have information on the beta test program.



Air Force photograph by TSgt. Sabrina Johnson

An MQ-1 Predator unmanned aircraft from the 361st Expeditionary Reconnaissance Squadron takes off from Ali Base, Iraq, in support of Operation Iraqi Freedom. Through the use of advanced capabilities, focused doctrine and detailed training, the Predator provides integrated and synchronized close air combat operations, to include intelligence, surveillance and reconnaissance.

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F-5N adversary avionics upgrade, test flights underway

Naval Air Systems Command Support and Commercial Derivative Aircraft program office at Patuxent River, Md., is upgrading the Navy's F-5N Adversary aircraft with new avionics to save the Navy an estimated \$20 million in future costs.

"The current inertial navigation system (INS) was becoming too old and costly to repair so a new system was found," said Jay Bolles, Adversary Integrated Product Team lead. "The cost to repair the older INS and buying a new, more capable system was about the same so the decision was made to go with the newer, more reliable system."

"The funding for the entire \$6.1 million upgrade program was split between the U.S. Navy Reserve, which fly the F-5Ns, and the Support and Commercial Derivative Aircraft program office," said Bolles.

"This is a textbook example of how a program should be run," said Capt. James Wallace, Support and Commercial Derivative Aircraft program manager. "Our Adversary team did it right. They worked with the Navy Reserve F-5N squadrons and Northrop-Grumman, to determine the most cost effective solution to this obsolescence challenge. Then they got to work and made it happen."

The LN-260 INS unit is produced by Northrop-Grumman in Woodland Hills, Calif. The cockpit display is produced by Interface, Display and Controls, of Oceanside, Calif. The LN-260 is also used on the U.S. Air Force F-16 Fighting Falcon aircraft. The new INS and new display bring a multi-function touch screen capability, a radar display, INS functions, embedded Global Positioning System and a new fiber optic gyro. The new INS is incredibly reli-



Navy photograph

The cockpit display for the F-5Ns new LN-260 Inertial Navigation System.

able with an estimated 5,000 hours of flying time between possible failures. Due to limited space in the F-5N's cockpit, a smaller display was needed.

Forty-four of the new systems, plus spares, will be bought for the upgrade program. The installation work will be done at Northrop-Grumman's facility in St. Augustine, Fla. Five F-5Ns are still in production, and will have the new INS installed during the conversion process.

The remaining F-5Ns will have the new INS installed as a drive through modification, or when they return to the St. Augustine depot for inspections and repairs. The installation consists of swapping out the old INS box with the new LN-260 box, removing old wiring and installing the new wiring. Approximately four F-5Ns per month will be upgraded, with the work taking one week to do.

Financial crisis has military implications, vice chairman says

by MSgt. Adam M. Stump
American Forces Press Service

The current global financial crisis is a far-reaching problem that has implications for the U.S. military and other organizations, the vice chairman of the Joint Chiefs of Staff said in Baltimore, Md., Oct. 16.

Marine Corps Gen. James E. Cartwright spoke to more than 150 business leaders, professors and students from the Johns Hopkins University Carey Business School about several different business-related topics.

The general said the recent Russia-Georgia conflict in South Ossetia played havoc with the Russian economy, which could have led to problems militarily.

"In this market turmoil, Russia and China could have chosen a different path that would have been incredibly difficult for us to survive," Cartwright said. He said they didn't do so because of the interdependence of the world's economy and "a con-

scious choice by their governments."

Cartwright said that interdependence is reflected in an "as they go, we go and as we go, they go" mentality, which is something that is easier to deal with than the Russian-U.S. strategy during the 1950s to 1980s.

"Much as nuclear weapons in the Cold War tended to be able to tell each other when we were uncomfortable, it's far more comfortable in my mind to use the economy to tell each other when we're uncomfortable," he said.

The market economy, the vice chairman added, is one of the most effective tools against al Qaeda, because it leaves a paper trail of how money is used. And although the U.S. economy is slumping, Cartwright said, it hasn't had an effect on military recruiting, because the "lines are out the door."

"When times get tough, the lines start to form," he said. When that happens, he explained, it typically means a deeper talent pool of potential recruits.

"We can raise our standards and keep them

high," Cartwright said. "That benefits the nation."

The military's 18- to 21-year-olds are the bulk of the force, doing high-risk jobs all over the world, the general said. This group of young people is different from the generals who lead them, he said.

"They don't think like us," the general said. "They don't have national boundaries in their mind. They live in [an information technology] world. They came up in an IT world. They are global in their mindset. As soon as you get them out and amongst cultures, they assimilate it very quickly."

He said whether manning a nuclear aircraft carrier or helping develop business as part of a provincial reconstruction team in Iraq or Afghanistan, the nation's service members are doing a phenomenal job.

"We can't get them to come home," Cartwright said. "They are so satisfied and self-fulfilled with that kind of work."

Cartwright said the model of the service member returning home will be a 24-year-old with three

combat tours in two different countries and with global experiences. He said the bulk will be the teachers, mayors, fire fighters, police officers and business people of tomorrow.

"That's our heritage," the vice chairman said. "That's what's going to keep us at the cutting edge. They will keep us competitive, even if we try to do otherwise. Our challenge is keeping up and making sure we don't screw it up for them."

Another business challenge the U.S. faces is funding research and development, Cartwright said. While the government still needs war fighting laboratories, there needs to be a solution to partnering with the civilian sector for funding.

"We believe as a government we'll take 10 or 15 of the smartest people in the world, we'll tell them what our problem is, stuff them in a room, stick pizza under the door until they come up with the answer and come out, then we'll keep it deep, dark secret for 10 or 15 years until we're ready to leak it to the private sector," he said. "That paradigm is long gone."

Helicopter-plane V-22 Osprey faring well in Iraq

by Bradley S. Klapper
Associated Press

After a troubled history, the V-22 Osprey - half-helicopter, half-plane - has been ferrying troops and equipment across Iraq for just over a year without a major incident.

Critics say the Osprey, which was designed to replace transport helicopters, lacks firepower for defense in heavy combat.

But pilots say the Osprey makes up for that in speed, which one of them says can take the plane "like a bat out of hell" to altitudes safe from small-arms fire.

The aircraft is made by Boeing and Textron's Bell Helicopter.

Since arriving at this sprawling desert base in western Iraq, a dozen Ospreys have been ferrying troops and equipment at forward operating bases. One even took around Barack Obama during his tour of Iraq earlier this year.

But on only a handful of occasions has the aircraft faced any serious enemy fire.

Military officials say this is partly a result of the changing nature of the war in Iraq as well as the advantages the high-flying Osprey has over the Vietnam-era Sea Knight helicopters they will eventually replace. The Osprey also avoids day

flights into Baghdad or other tasks that entail excessive risk.

"It's not the same World War II tactics that we used to deal with, or even Vietnam tactics," said Maj. Paul Kopacz, a pilot of the Osprey on a recent mission to Fallujah. "We have not been battle-tested because we aren't going guns blazing into hot zones. Our nation is now too sensitive to the loss of soldiers to let that happen."

The military calls the Osprey a "tilt-rotor" aircraft, because it takes off with its rotors set vertically like a helicopter and glides in the air with them thrust forward as on an airplane. The shift requires only a pull of the lever by the pilot.

The aircraft, which took over two decades to develop, has been plagued by a series of technical failures and deadly crashes - including a pair in quick succession in 2000 that killed 23 Marines and nearly scuttled the entire project.

Some skeptics have attacked the design of the plane because they feel it is too slow in descent, lacks maneuverability, kicks up too much dust and should have been delayed until designers mastered the idea of "autorotation" - which would keep the rotors spinning even if both engines are taken out.

Another issue has been the lack of firepower on the Osprey, which does not in-

clude a mounted gun on the front as once envisaged - although the Marines have placed a machine gun at the rear.

There are also the aircraft's soaring costs, which have pushed the bill to over \$100 million per unit including research and development expenses.

Still, it has won wide support from the Marines flying the machine in Iraq since September 2007, even among those with long experience as pilots of the CH-46 Sea Knight. They say problems experienced so far have been caused by desert dust and heat, mostly related to avionics and nothing that has overly confounded technicians.

"I used to fly the CH-46 and we couldn't do nearly what we do now in terms of weight, cargo, distance or speed," said Lt. Col. Christopher Seymour, commanding officer of what is now the third Osprey squadron at Asad Air Base, a complex in the desert of western Iraq that houses 10,000 U.S. servicemen.

Seymour and the other pilots at Asad say they've noticed the Osprey's advantages most. It can travel twice as fast and three times farther than the Sea Knight, is equipped with radar, lasers and a missile defense system, and soars at altitudes far above its 39-year-old predecessor.

"It's a gorilla. The ability to accelerate

to speeds is so strong," Seymour said, adding that the Osprey's benefits will become even more evident as the military continues to move away from ground convoys, which face roadside bombs and ambushes. "Like a bat out of hell you're at altitudes safe from small arms fire."

The Osprey is certainly an awesome sight. In helicopter mode, its twin nacelles point downward as if they were pistols in a holster. At night, its neon-tipped rotors sparkle like emeralds.

During a mission last week, on which an Associated Press reporter and photographer accompanied Marines, the only problem involved its global positioning system.

But Maj. Andreas Lavato, one of the pilots, said the aircraft is built with so many backup systems - what the Marines call "redundancies" - that there are no concerns over engine or computer problems.

One engine, he said, can still power both propellers at a somewhat lower speed, he said as the aircraft traveled at 280 mph about 9,500 feet above Anbar province in western Iraq. Each vital computer system has at least two backups.

"I'm an old helicopter guy myself and I really didn't feel confident flying with this thing until about 70 hours," said Lavato, 36, who piloted the Sea Knight

for a decade. "That's with the technology, because the flying is really easy. It didn't really take long to fall in love with this and realize its capabilities."

He conceded that the Osprey's lack of firepower - it has only a 7.62 mm machine gun at its rear, one fewer weapon than the Sea Knight - caused part of his initial skepticism.

But he insisted that speed and elevation were more important, as the Ospreys are largely avoiding descents into "hot zones" or violent areas unprepared by aircraft more geared for attack.

"Nobody sees us and you have to see something to shoot it," Lavato said. "If I'm coming into a situation I can just leave and get from 0 to 200 knots in about 10 seconds. I'm just gone."

Kopacz, meanwhile, rejected the idea that the multibillion dollar Osprey project was being shielded from the real fight to protect its record.

"We are flying into every zone out here - they are just not hot when we land," he said. "Is that because we are so quiet coming in? Is it because we're not low and slow?"

Kopacz said people can hear a helicopter from 10 miles away.

"You can't hear us until two miles away," he said, "and we're coming fast."

India launches first unmanned moon mission

by **Gavin Rabinowitz and Seth Borenstein**
Associated Press

India launched its first mission to the moon Oct. 22, rocketing a satellite up into the pale dawn sky in a two-year mission to redraw maps of the lunar surface.

Clapping and cheering scientists tracked the ascent on computer screens after they lost sight of Chandrayaan-1 from the Sriharikota space center in southern India. Chandrayaan means "Moon Craft" in ancient Sanskrit.

Indian Space Research Organization chairman G. Madhavan Nair said the mission is to "unravel the mystery of the moon."

"We have started our journey to the moon and the first leg has gone perfectly well," he said.

Chief among the mission's goals is mapping not only the surface of the moon, but what lies beneath. If successful, India will join what's shaping up as a 21st century space race with Chinese and Japanese crafts already in orbit around the moon.

To date only the United States, Russia, the European Space Agency, Japan and China have sent missions to the moon.

As India's economy has boomed in recent years, it has sought to convert its newfound wealth - built on the nation's high-tech sector - into political and military clout. It is hoping that the moon mission - coming just months

after finalizing a deal with the United States that recognizes India as a nuclear power - will further enhance its status.

Until now, India's space launches have mainly carried weather warning satellites and communication systems, said former NASA associate administrator Scott Pace, director of space policy at the George Washington University. "You're seeing India lifting its sights," Pace said.

While much of the technology involved in reaching the moon has not changed since the Soviet Union and the United States did it more than four decades ago, analysts say new mapping equipment allows the exploration of new areas, including below the surface.

India plans to use the 1,000-pound lunar probe to create a high-resolution map of the lunar surface and the minerals below. Two of the mapping instruments are a joint project with NASA.

In the last year, Asian nations have taken the lead in moon exploration. In October 2007, Japan sent up the Kaguya spacecraft. A month later, China's Chang'e-1 entered lunar orbit.

Those missions took high-resolution pictures of the moon, but are not as comprehensive as Chandrayaan-1 will be or NASA's half-a-billion-dollar Lunar Reconnaissance Orbiter scheduled to be launched next year, Pace said. The most comprehensive maps of the moon were made about 40 years ago during the Apollo era, he said.

"We don't really have really good modern maps of the moon with modern instrument," Pace said. "The quality of the Martian maps, I would make a general argument, is superior to what we have of the moon."

NASA has put probes on Mars' frigid polar region, but not on the rugged poles of the moon.

Yet the moon's south pole is where NASA is considering setting up an eventual human staffed lunar outpost, Pace said.

The moon's south pole is "certainly more rugged than where Neil Armstrong landed. It's more interesting. It's more dangerous," Pace said. "We need better maps."

Beginning in 2008, India became the first Asian country to put its own astronauts into space. It followed that last month with its first spacewalk.

More ominously, last year China also blasted an old satellite into oblivion with a land-based anti-satellite missile, the first such test ever conducted by any nation, including the United States and Russia.

The Indian mission is not all about rival and prestige. Analysts say India stands to receive valuable rewards from the technology it develops and, according to Pace, it already shows increased confidence in difficult engineering and quality control.

The 1,000 million mission will test systems for a future moon landing, with plans to land a rover on the moon in 2011 and eventual a manned space program, though this has not been authorized yet.

And the Indian space agency was already dreaming of more.

"Space is the frontier for mankind in the future. If we want to go beyond the moon, we have to go there first," said Indian space agency spokesman S. Satish.



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Mojave-based L-1011, Pegasus launches IBEX solar wind explorer satellite

by **Raphael Jaffe**
staff writer

NASA's Interstellar Boundary Explorer mission, or IBEX, was successfully launched from the Kwajalein Atoll Oct. 19.

Orbital Sciences used its L-1011 aircraft, the Stargazer, as the carrier for its Pegasus rocket, which carried IBEX into orbit. It was the 26th consecutive fully successful mission for the Pegasus. Stargazer is based at the Mojave Air and Space Port between missions.

IBEX is designed to be the first spacecraft to image and map dynamic interactions taking place in the outer solar system.

"After a 45-day orbit raising and spacecraft checkout period, the spacecraft will start its exciting science mission," said IBEX mission manager Greg Frazier of NASA's Goddard Space Flight Center.

The IBEX team designed a groundbreaking concept for placing a spacecraft into high-altitude orbit using the least expensive launch vehicle in NASA's arsenal - a Pegasus rocket - coupled with an additional IBEX-supplied solid rocket motor and the spacecraft's hydrazine propulsion system. Pegasus will carry about 1,000 lb to low Earth orbit. Pegasus delivered IBEX to an altitude of about 120 miles, pointed it in the desired direction, and spun it up to 60 rpm and released it. After discarding a lightweight adapter cone, the additional IBEX STAR-27 SRM carried IBEX into a medium-altitude parking orbit. After discarding the spent SRM casing, IBEX will use its internal hydrazine system over several orbits to raise its apogee to 200,000 miles and its perigee to about 4,400 miles above the Earth.

Just as an impressionist artist makes an image from countless tiny strokes of paint, IBEX will build an image of the outer boundary of the solar system from

impacts on the spacecraft by high-speed particles called energetic neutral atoms. These particles are created in the boundary region when the 1-million mph solar wind plows into the gas of interstellar space. This region is important to study because it shields many of the dangerous cosmic rays that would flood the space around Earth.

"No one has seen an image of the interaction at the edge of our solar system where the solar wind collides with interstellar space," said IBEX Principal Investigator David McComas of the Southwest Research Institute in San Antonio. "We know we're going to be surprised. It's a little like getting the first weather satellite images. Prior to that, you had to infer the global weather patterns from a limited number of local weather stations. But with the weather satellite images, you could see the hurricanes forming and the fronts developing and moving across the country."

The heliosphere, in which the Sun and planets reside, is a large bubble inflated from the inside by the high-speed solar wind (plasma) blowing out from the Sun. Pressure from the solar wind, along with pressure from the surrounding interstellar medium, determines the size and shape of the heliosphere. The heliosphere also is responsible for shielding out much of the galactic radiation coming in from the interstellar medium. IBEX will be the first spacecraft to observe the invisible interactions occurring at this boundary. The supersonic flow of solar wind abruptly slows at the termination shock, the innermost boundary of the solar system. The edge of the solar system is its heliopause. The bow shock pushes ahead through the interstellar medium as the heliosphere plows through the galaxy.

From its vantage far above Earth's relatively bright magnetosphere, the spacecraft's energetic neutral atom sensors will assemble global images that



reveal the broad heliospheric interactions for the first time. These ENAs are produced by a process called "charge exchange," which neutralizes previously charged particles in the interactive region within the interstellar medium. Once neutralized, some ENAs travel inward toward the Sun where they can be observed by the spacecraft.

IBEX needs to go beyond the region of space controlled by Earth's magnetic field, called the magnetosphere, because this region generates radiation and the same high-speed atoms that IBEX will use to make its pictures. To avoid contamination from local ENAs produced in the magnetosphere, IBEX's orbit will take it up to 200,000 miles from Earth.

"The solar system's frontier is billions of miles away, so it's difficult for us to go there, but interesting things happen at boundaries, and with IBEX, we will see them for the first time," said Dr. Robert MacDowall, IBEX Mission Scientist at NASA's Goddard Space Flight Center in Greenbelt, Md.

Voyagers 1 and 2 reached the ter-

mination shock in 2005 and 2007, respectively, taking point measurements as they left the solar system. While exciting and valuable, the data they provided about this region raised more questions than they resolved. IBEX will use energetic neutral atom imaging to, for the first time, make global images of the complex interactions (simulated in animation) occurring at the edge of the solar system. The spacecraft will complete one all-sky map every six months.

The IBEX mission is funded by NASA's Small Explorer program. The cost is \$165 million. It is a PI-led mission being run by SwRI, which is responsible for all aspects of the mission. Orbital Science Corporation in Dulles, Virginia, is SwRI's sub-contractor for the IBEX spacecraft and also provides the Pegasus launch. The Explorer Project Office at NASA Goddard oversees all Small Explorer missions, including IBEX.

NASA sees no quick fix for broken Hubble telescope

NASA's efforts to get the ailing Hubble Space Telescope working again have hit a snag, and engineers are trying to figure out their next step.

Officials had hoped to have the 18-year-old observatory back in business Oct. 17, after it stopped sending pictures three weeks ago. But a pair of problems cropped up Oct. 16, and now recovery operations are on hold.

It's unclear how long the telescope will be prevented from transmitting its stunning photos of the cosmos.

So far, this isn't the longest that Hubble has been inactive since NASA's 1993 mission to correct its blurred vision. In 1999, science operations were halted about six weeks because of gyroscope failures that were remedied by astronauts whose flight quickly followed the breakdown. AP

Congress cancels novel satellite program

With a federal budget crunch looming, Congress this month canceled Pentagon plans to buy and launch two commercial imagery satellites to complement its network of classified spy craft, military and space industry officials said.

House and Senate defense appropriations committees cut all funds for the satellite program during a conference to work out differences in the classified 2009 bills that approve intelligence spending. They also erased the remaining 2008 funds.

Congress "zeroed" the budget, cutting about \$1 billion, said an industry official with direct knowledge of the program. The exact budget is classified, but the program was expected to cost about \$1.7 billion, according to Pentagon documents and military and industry officials who spoke on condition of anonymity to discuss the classified information.

The cut means the next administration will not be locked into an expensive and potentially controversial program to buy new satellites while paying for wars in Iraq and Afghanistan as well as the \$700 billion national financial rescue. AP

NASA sends space shuttle back to hangar

NASA pulled space shuttle Atlantis off the launch pad and sent it back to the hangar Oct. 20 to await a trip to the Hubble Space Telescope next year.

Atlantis was originally scheduled to blast off this month on a mission to make various repairs and upgrade the telescope.

Astronauts now will need time to train for a telescope repair they hadn't planned on. AP

Criticism hurting space agency morale

by **Jay Reeves**
Associated Press

Unfounded criticism of America's next-generation moon rocket is hurting NASA morale but hasn't stopped progress on the craft, the space agency's administrator Michael Griffin said Oct. 21.

Griffin said critics in the media and on anonymous Internet blogs can "chip away" at the agency by questioning the motives and ethics of engineers designing the new rockets.

Briefing charts used by NASA managers sometimes show up on Web sites without the proper context, he said, and opponents of the agency's plans to replace the space shuttle with two new rockets have wrongly accused NASA managers of incompetence and worse.

"Are we at a place where differences of engineering (opinion) are cited as evidence of lying or malfeasance? This is not how any of us were taught to conduct an engineering discussion," he said at a symposium of top NASA leaders and industry executives in Huntsville, Ala.

Griffin said the criticism hasn't slowed development of the Ares rockets being designed for the Constellation program to lift astronauts and cargo to the space station, the Moon and eventually Mars, but it is still hurting.

"I think there is a certain amount of damage to people's morale that accrues when they know themselves that they are doing good work and telling the truth and the product of their work is besmirched anonymously by others who bring forward no data and can do so almost continuously," he said.

A NASA safety panel reported in August that the space agency and its moon program had problems related to employee morale, funding and leadership.

NASA plans to fly a test version of the Ares rocket in late spring or early summer

and retire the space shuttle in 2010. The first missions aboard Ares are scheduled for 2015.

Griffin said NASA is studying the effects of both delaying the shuttle's retirement and speeding up work on Ares. Some lawmakers are worried that NASA might not be able to reach the space station if the shuttle is down and Ares isn't ready.

"I'm not blind to the fact that several legislators have called out the need to look at such questions in the next Congress, and I think if such questions are going to be asked, it's best for the answers to come from NASA," he said.

Frank A. Slazek, the president of the American Astronautical Society, which promotes space science and exploration, said he expects either Democrat Barack Obama or Republican John McCain to continue the Constellation program after taking office in January.

NASA spending on the project is "infinitesimally small" compared to the \$700 billion financial bailout approved by Congress, he said, and the government-funded program will provide a boost to the technology sector amid a crunch in commercial credit.

President Bush signed a bill that would provide \$20.2 billion for NASA in the upcoming year, including an additional \$1 billion to speed up work on Constellation. But the next administration and Congress must decide how much of that money to actually spend.

"I think there is a certain amount of damage to people's morale that accrues when they know themselves that they are doing good work ... and the product of their work is besmirched anonymously by others."

University of Colorado professors conduct new laser research

by Maria Callier
Arlington, Va.

A University of Colorado at Boulder husband and wife research team, Professor Margaret Murnane and Dr. Henry Kapteyn, have developed new, practical, laser-like sources in the ultraviolet and soft x-ray regions based on the most extreme form of nonlinear optics.

In this work, an intense femtosecond laser is focused into a gas-filled hollow waveguide. The interaction

between the laser field and the atoms in the gas is so strong that electrons are violently accelerated and then liberate their energy as a coherent beam of x-rays.

Ultrafast coherent beams of x-rays have a myriad of applications in technology and science - from next-generation microscopes that have the capability to image thick samples in 3-D, to understanding how heat flows in nanostructures or how electrons move at interfaces relevant to energy harvesting.

Murnane and Kapteyn established a student lab at CU—Boulder that pursues cutting-edge laser technologies, and their application in both science and technology.

"Our research straddles the boundary between laser science and technology. We take ideas all the way from conception to integration in systems that can then be used by

Courtesy of Greg Kuebler

Ultrafast flashes of x-rays can eject an electron from a molecule, leaving the molecule in a super excited state that eventually causes it to break apart.

other scientists. This takes a team of physicists, engineers and chemists all working together, said Murnane."

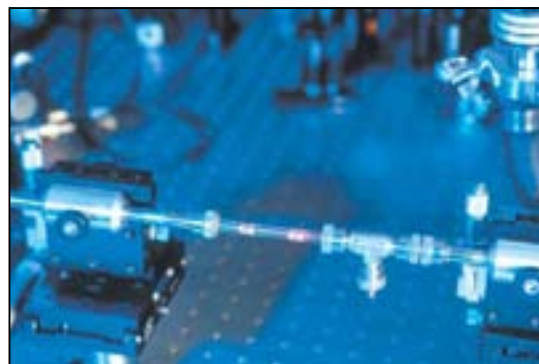
This research impacts the Air Force by making ultrafast lasers useful in remote sensing, missile defense and adapted optics. The femtosecond lasers that the group develops to power the x-ray source are also used in micromachining and may be applied to aircraft aerodynamics and high-performance engines.

Murnane and Kapteyn are the first researchers to explore how atoms and molecules respond to light pulses. That work may lead to possible future technologies that use the high energy densities of lasers.

"We discovered that the interaction of atoms and molecules is both useful for making coherent x-rays, which in the future may image previously undetectable cracks in jet turbine blades. They are also helpful in uncovering electron dynamics at the 'attosecond' time scale domain," added Murnane.

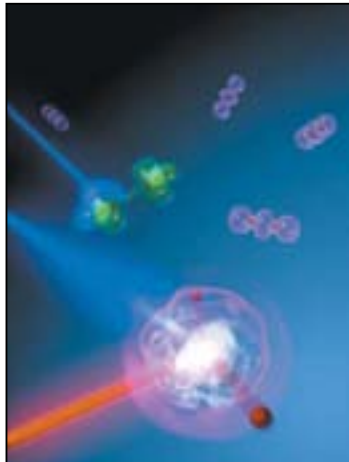
A major future challenge is to find ways of generating coherent x-ray beams, which require the scientists to control quantum phenomena at very high laser intensities. The challenges have also yielded new demands on the technology the couple uses to meet their goals.

"After a number of years of exploiting the laser technology that we already developed, we are now plan-



Courtesy of the University of Colorado

Extreme nonlinear optical techniques have succeeded in upconverting visible laser light into x-rays, making a tabletop source of coherent soft x-rays possible.



ning a new push for high-power laser technologies," said Murnane.

Simultaneous to their research about new laser technologies, the couple is also celebrating an upcoming honor. In March 2009 in Salt Lake City, Utah, they will be presented the Ahmed Zewail Award in Ultrafast Science and Technology "for outstanding and creative contributions by a nominee to fundamental discoveries or inventions in ultrafast science and technology in the areas of physics, chemistry, biology or related fields without regard to

age or nationality."

"We are thrilled and more than a bit surprised! And we very grateful because this is the first time we received a joint award. Given how important teamwork in our group, we were very thankful to ACS for allowing a joint award. This is a relatively new award, established in 2005. We are absolutely over the top proud to have our names associated with Ahmed Zewail - the 1999 chemistry Nobel laureate who originated the field of "femtochemistry," said Murnane.

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Myles D. Crandall named president of Savi Group

Myles D. Crandall, who has more than 25 years of program, business management and executive experience, has been named president of Savi Group, a Lockheed Martin information and technology company providing real-time supply chain and asset management solutions.

Crandall assumes full operational and strategic leadership responsibility of Savi Group, and remains as Savi Group's chief operating officer, a position he has held since April.

Prior to joining Savi, Crandall served as vice president of Strategic Planning at Lockheed Martin Space Systems Company, responsible for leading the company's strategic planning process in coordination with the Corporation and other Lockheed Martin business units. In addition to holding a variety of program and line-of-business executive positions at Lockheed Martin, Crandall worked for three years at Bechtel Corporation, where he served as a principal vice president as well as president of Bechtel's Civil/Water Global Industry Units.

Savi Group comprises the Savi Technology and Savi Logistics Systems lines of business and the Savi Networks joint venture with Hutchison Port Holdings. Savi Group also co-develops solutions with other Lockheed Martin divisions on large, complex government projects for In-Transit Visibility, cargo security and asset management.

Northrop elects Madeleine Kleiner to board

Madeleine Kleiner, former executive vice president and general counsel for Hilton Hotels Corporation, has been elected to Northrop Grumman's board of directors.

The board now totals 14 members, 13 of whom are non-employee directors.

"Madeleine Kleiner's broad-based business, legal and public affairs experience makes her an outstanding choice for our board," said Ronald D. Sugar, Northrop Grumman chairman and chief executive officer.

In her role at Hilton, Kleiner was responsible for overseeing the company's legal affairs and the ethics, privacy and government affairs functions, and was a member of the executive committee, with significant responsibility for board of directors matters. She left Hilton

in February 2008 after completing her responsibilities in connection with the sale of the company.

Previously, she served as senior executive vice president, chief administrative officer and general counsel of H.F. Ahmanson & Company and its subsidiary, Home Savings of America. She was responsible for overseeing the legal department, as well as human resources, legislative and government affairs and corporate communications.

Kleiner previously was a partner at the Los Angeles-based law firm of Gibson, Dunn and Crutcher, where she practiced corporate law, representing clients in mergers and acquisitions, as well as securities transactions and general corporate matters, including advising boards of directors in connection with such matters.

From 1999 through 2001 she served as a director of a number of Merrill Lynch mutual funds operating under the Hotchkiss and Wiley name.

Kleiner earned her bachelor's degree from Cornell University and her Juris Doctorate from Yale Law School. Upon graduation, she served as a law clerk to the Honorable William P. Gray, U.S. District Court for the Central District of California.

Northrop Grumman elects Bruce S. Gordon to board

Bruce S. Gordon has been elected to Northrop Grumman's board of directors.

"Bruce Gordon is a highly experienced director with a distinguished career as an executive in the telecommunications industry and as the leader of the NAACP," said Ronald D. Sugar, Northrop Grumman chairman and chief executive officer.

Gordon completed a 35-year career in the telecommunications industry in 2003, retiring as the President of the Retail Markets Group for Verizon Communications Inc. As an employee of Bell Atlantic corporation, he served as Group President of the Enterprise Business Unit, President of Consumer Services, Vice President of Marketing and Sales, Vice President of Sales, and General Manager of Marketing for Pennsylvania & Delaware. He started with the company in 1968. Gordon later became the first business executive to head the National Association for the Advancement of Colored People, and led the 500,000 member organization from 2005 to 2007. During his

tenure Gordon worked to foster diversity and inclusion and to achieve greater economic equality for all Americans.

Gordon earned his bachelor of arts degree from Gettysburg College and a masters of science degree in management from the Massachusetts Institute of Technology as an Alfred P. Sloan Fellow.

Northrop Grumman appoints communications director for IT sector

Northrop Grumman has named J. Michael Landrum director of communications for the company's Information Technology sector, effective Oct. 27.

Landrum will report to Linda A. Mills, corporate vice president and president of Northrop Grumman IT.

Landrum, who joined the company in 2001 as director of marketing for the Integrated Systems sector, will oversee all Information Technology communications and positioning activities, planning and implementing comprehensive programs to support new business opportunities and managing employee and executive communications.

Landrum earned a bachelor's degree from West Point and a master's degree from the University of Virginia. He was a National Security Fellow at the Harvard John F. Kennedy School of Government and a Senior Fellow at Johns Hopkins School of Advanced International Studies. He retired from the Army as a colonel and is also a graduate of the Naval War College.

Northrop Grumman names communications director for Space Technology Sector

Northrop Grumman has named Lon L. Rains director of communications for the company's Space Technology sector, where he will guide efforts to increase the visibility of the company's capabilities in civil and military space, missile defense and high-energy lasers.

Rains is a veteran journalist with broad and deep knowledge of the aerospace industry. He will report directly to Alexis Livanos, corporate vice president and president of Northrop Grumman Space Technology. His appointment is effective Nov. 17.

Most recently, Rains served as vice president of Imaginova Trade Publishing (Editorial) and editor of *Space News*.

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Mojave Air & Space Port renews Scaled lease

by **Raphael Jaffe**
staff writer

The East Kern Airport District on Oct. 21 approved a lease renewal for Scaled Composites, and a new retainer agreement with the District's attorney; heard a report on ongoing construction projects at Mojave Air and Space Port; and expressed appreciation for the advocacy of local Congressman Kevin McCarthy.

The Scaled Composites lease is for five years, starting Nov. 1, and there are three five-year renewal terms. Rent is \$0.189 per month per square foot for the first year, and it then will be adjusted annually. Building 75 and associated flightline ramp is located on the 71,721 square foot parcel.

For the past four years, the District has paid a monthly retainer of \$3,390 to attorneys Lemieux and O'Neill. A new retainer agreement has been negotiated, calling for a monthly retainer of \$4,600. General Manager Witt feels this is equitable. It reflects the increased time, an average of 26 hours per month, to attend board and staff meetings, negotiate, review and execute contracts, review and draft legal opinion and advice letters. The discounted retainer rate is

\$180 per hour, which is a 20 percent discount. There is no termination date in the agreement. Scott C. Nave continues as District counsel. Litigation fees are not included in this retainer agreement. Director Rutan expressed his appreciation for the good job that Nave and Witt have been doing, i.e. no recent lawsuits.

Construction of the Compass Rose is continuing; painting has started. Work on the engine run-up pad is continuing. District Engineer Dave Russell found problems with a concrete pour, and the contractor has removed the defective material and re-poured.

Board member Cathy Hansen is sponsoring a barbecue fundraiser for McCarthy at her hanger. Witt expressed support for McCarthy, not on a partisan basis, but for all the assistance the congressman has given the district in his two years. The FAA approved projects have included the runway extension, taxiway and lighting improvements, a high speed fiber net backbone that connects all tenants, and continued advocacy for commercial space flight licenses for the Spaceport, and its tenants.

Similarly, Witt and the board have expressed support for the Mojave

School Bond measure. They point out that quality schools are a tremendous asset in recruiting skilled personnel, and upgrading the community's attractiveness.

The board engaged Michael D. Hardee Consulting. He is to help establish a government fuel storage and delivery capability and has made progress. At present, tenants and transients who qualify for use of a government fuel credit card cannot use it at Mojave. When the district can accept such sales, it will be a great service to users; and the district will have a small profit from the fuel flow-through fees. Aviation fuel prices have decreased markedly in the last few weeks. Witt has authorized a discount on the price of fuel now in inventory, so that as the higher priced fuel moves out, lower priced fuel can be purchased. As usual, the district will maintain a lower fuel price than nearby airports, to encourage use of its facilities.

Mojave Air and Space Port recently upgraded its perimeter security using cameras and monitors by ICX Technologies. They have requested permission to use Mojave Air and Space Port as a "beta demonstration" site. That would involve ICX installing upgraded

equipment, such as 40-inch monitors, and bringing their potential customers to see the system, perhaps via remote hook ups. Staff was authorized to dis-

cuss this proposal, with an awareness of possible negative factors, such as possibly compromising tenant confidentiality.

Calendar

Oct. 26-30 - 5th Spitzer Science Conference: New Light on Young Stars - Spitzer's View of Circumstellar Disks, Pasadena, Calif.

www.ipac.caltech.edu/spitzer2008/
Oct. 26-31 - 2008 Huntsville Workshop: The Physical Processes for Energy and Plasma Transport across Magnetic Boundaries, Huntsville, Ala.
http://hsvworkshop.msfc.nasa.gov/

Oct. 27-30 - International Telemetry Conference, San Diego, Calif.
http://telemetry.org/pages/information/itc2008.php

Oct. 28-30 - The National Space INFOSEC (Information Systems Security) Symposium, El Segundo, Calif.

www.aero.org/conferences/infosec/index.html

Oct. 28-31 - Joint Annual Meeting of LEAG-ICEUM-SSR, Cape Canaveral, Fla.

www.lpi.usra.edu/meetings/leagilewg2008/

Oct. 29-31 - ESA Workshop on Avionics Data, Control and Software Systems, Noordwijk, The Netherlands
www.congex.nl/08c38/

Dec. 2-3 - Microelectronics Reliability & Qualification Workshop, Manhattan Beach, Calif.

www.aero.org/conferences/mrqw/index.html

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San Francisco hosts 2008 Fleet Week



Photographs by John Battey



by John Battey
staff writer

With the Golden Gate Bridge and the notorious Alcatraz Island serving as a backdrop, the U.S. Navy Blue Angels and the Canadian Forces Snowbirds both performed a magnificent aerial demonstration as part of San Francisco Fleet Week 2008.

The annual Columbus Day-weekend show has been showcasing the U.S. every year since 1981.

Although the six-plane Blue Angels and nine-plane Snowbirds thrilled the crowd, they were not the only highlight of the weekend.

The show began with a parade of ships arriving in the bay sailing under the Golden Gate Bridge and cruising between Pier 39 and Alcatraz Island. The parade was led by the S.S. Jeremiah O'Brien

and the U.S. Coast Guard Cutter Bertholf.

The U.S. Air Force was well represented with the F-16 West Coast Tactical Demonstration Team performing a full tactical demonstration followed by a heritage flight with an F-86 Sabre.

The F-16 was piloted by Capt. Russ T. Piggott and Russ's father was also on hand at the event, performing a demonstration in a Sukhoi SU-29 aerobatic plane.

The U.S. Marine Corps had a MV-22A Osprey perform several flybys over the bridge and island.

A Virgin America Airbus A-320 airliner made a couple of low passes over the Golden Gate Bridge.

The four-ship aerobatic team, the Collaborators, performed a unique flying display and the Patriots civilian jet team performed a fantastic show in their four L-39 trainer jets that included

the rarely seen tail slide by all four jets.

The U.S. Coast Guard's HH-65C Helicopter performed a search and rescue demonstration in the water and several Coast Guard Vessels patrolled the waters keeping the air show box open for the performers.

Sean D Tucker in his Oracle Challenger biplane performed his one of a kind aerobatic display doing torque rolls, loops and a simulated harrier pass.

Melissa Andrzejewski flew an exciting demo in her Edge 540 and Michael Wiskus performed an amazing low-level act in his Pitts S-2B. Tim Weber performed in his Extra 300S.

Fat Albert, the Blue Angels C-130 Transport made several high-speed flybys including a very impressive low level pass over Alcatraz Island.

The U.S. Navy Blue Angels wrapped up the show with a spectacular 45-minute demonstration in their high performance F/A-18 Hornets. The

show was performed over the water and included four-plane diamond formations and two opposing solo's performing crossing passes and ending with many exciting six-ship delta routines.

The highest maneuver during their show was the solos vertical rolls at 15,000 feet and the lowest altitude was the 700 mph low-level sneak pass performed at less than 50 feet creating an awesome wake in the ocean.

The Blue Angels will perform 66 shows at 35 sites this year. The team has performed for over 427 million spectators including over 15 million during the 2007 air show season.

The 2008 San Francisco Fleet Week Air Show once again proved to be one of the most outstanding showcases of U.S. Military and civilian aerobatics seen in the United States each year and with the backdrop of the Golden Gate Bridge it has to be one of the most beautiful places the Blue Angels fly each year.

COMMON SENSE

No debate

by **Oliver North**
© Creators Syndicate

CAMP LEJEUNE, N.C. - Most of the 2,300 young Americans of the 24th Marine Expeditionary Unit missed all three of this year's presidential debates.

They were too busy fighting the Taliban and al Qaeda in Afghanistan to watch the first two and en route home to this sprawling coastal Carolina base during last week's give and take. Few of them have had the opportunity to see the man who will be their next commander in chief - even on television. Though they don't talk much about politics or politicians, there is one thing that they all seem to want - no matter their age, rank or color of their skin. There's no debate; they want victory.

This isn't the first time we've met these Marines. The 24 MEU is built around the 1st Battalion, 6th Marines. In August, our *Fox News Channel's "War Stories"* documentary team was embedded with 1/6 in Afghanistan. Back in 2006, we lived with them in Ramadi, Iraq, when Anbar province was the bloodiest place on the planet. According to Col. Peter Petronzio, the MEU commander, and Lt. Col. Anthony Henderson, the commanding officer of 1/6, more than half these Marines have made multiple deployments in this long war against radical Islam. And while there is no such thing as a "typical Marine," what they say about what they have accomplished is nearly universal.

One of them is a 22-year-old sergeant, named Courtney Rauch. He and his wife, Vanessa, were part of our 2007 documentary *"The Homefront to the Frontlines,"* which we shot in Iraq and here at Camp Lejeune. He returned from his first combat tour unscathed. But this time, he was not so

fortunate.

On Aug. 3, a massive improvised explosive device detonated directly beneath his lead vehicle in our four-Humvee patrol through one of the most heavily contested parts of Helmand province, Afghanistan. The blast blew Chris Jackson, our cameraman, out the right rear door, and the heavily armored Humvee was engulfed in flames immediately.

The driver, Cpl. Arnaldo Figueroa, and Sergeant Rauch, both wounded, were trapped in the front of the burning vehicle. Despite his own wounds from shrapnel and the blast, Jackson immediately jumped up and scrambled back to the burning vehicle. As ammunition "cooked off" inside the Humvee, Jackson somehow jerked the buckled armored door open and dragged Sergeant Rauch to safety. On the left side of the vehicle, Corporals Wright and Donald did the same for Cpl. Figueroa. Both badly wounded men were dragged to safety behind the next vehicle in the column and treated by the unit's two U.S. Navy medical corpsmen, Jose Pena and Gregory Cox, while Lt. John Branson, the platoon commander, deployed his Marines to secure a helicopter landing zone.

Within minutes of the explosion, a Humvee-mounted quick-reaction force, an armed UH-1N "Huey" and an AH-1J "Cobra" gunship were headed our way. They arrived just as a CH-46 Sea Knight helicopter swooped in to evacuate the casualties. Less than 20 minutes after the blast that almost killed them, the two wounded Marines were in the air headed for the big British hospital at Camp Bastion.

Within hours, both men, suffering from shattered limbs and shrapnel wounds, were flown first

to Landstuhl Regional Medical Center in Germany and then to the National Naval Regional Medical Center in Bethesda, Md. By then, Sergeant Rauch was missing his left leg below the knee. His wife, Vanessa, met him there when he arrived.

Jackson's cameras and equipment in the Humvee were blasted to pieces and burned beyond recognition. He had a shrapnel wound in his right leg and undoubtedly a concussion from the explosion. Yet he refused to be evacuated, claiming that he stayed in the field because: "In every hour of videotape that Oliver North shoots, there are five or six really good seconds. I knew I could do better." That might have been true before the IED went off, but for several days while we waited for news to arrive, I had the only camera.

Last week, Sergeant Rauch took leave from Walter Reed Army Medical Center, where he will be fitted soon for a prosthetic leg. He and Vanessa returned to Camp Lejeune to welcome his comrades in arms back from Afghanistan and for a reunion with Chris Jackson, who told them, "I only did what anyone else would have done in similar circumstances." With his lovely wife beside him, Sgt. Rauch said into our camera: "I would rather not have lost my leg, but I would do it all over again. I know we are making a difference."

It has been my great blessing to have spent most of my life in the company of heroes - selfless people who put themselves at risk for the benefit of others. There is certainly no debate that the word defines Chris Jackson, Courtney Rauch and the young American volunteers here at Camp Lejeune. They deserve to have a commander in chief who knows that "victory" is not a four-letter word.

How to contact

Aerotech News and Review

- Mail: 456 E. Ave. K-4, Suite 8, Lancaster CA 93535
- E-Mail: aerotech@aerotechnews.com
- Phone: (661) 945-5634
- Fax: (661) 723-7757

Advertising

- Corporate Headquarters: (661) 945-5634
- Arizona Headquarters: (623) 487-7321
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Aerotech News and Review

456 E. Ave. K-4, Suite 8

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e-mail: aerotech@aerotechnews.com

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Furniture & Appliances

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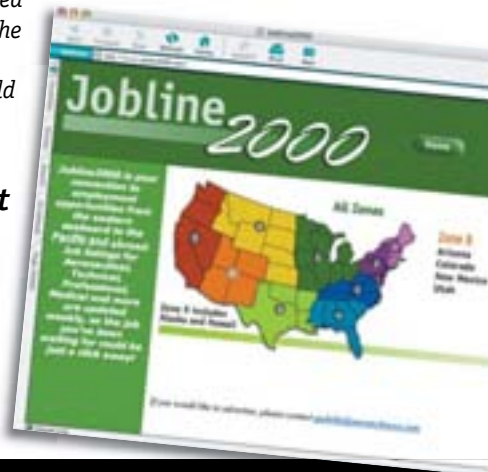
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