

MARSHALL STAR

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June 6, 2002

Chandra's darkness-dodging, high-flying orbit *Observatory's unique orbit a challenge for Marshall engineers*

by Sherrie Super

Every 64 hours, NASA's Chandra X-ray Observatory follows a path that dodges darkness, stretches one-third of the way to the Moon, and has a more elliptical shape than most orbiting satellites.

Chandra's unique orbit — selected by engineers at the Marshall Center — is a reflection of the unique requirements to ensure the world's most powerful X-ray telescope could deliver its groundbreaking images to Earth.

Chandra began collecting unprecedented images of our universe in

August 1999. In just over two years, Chandra has found the most distant X-ray cluster of galaxies, captured the deepest

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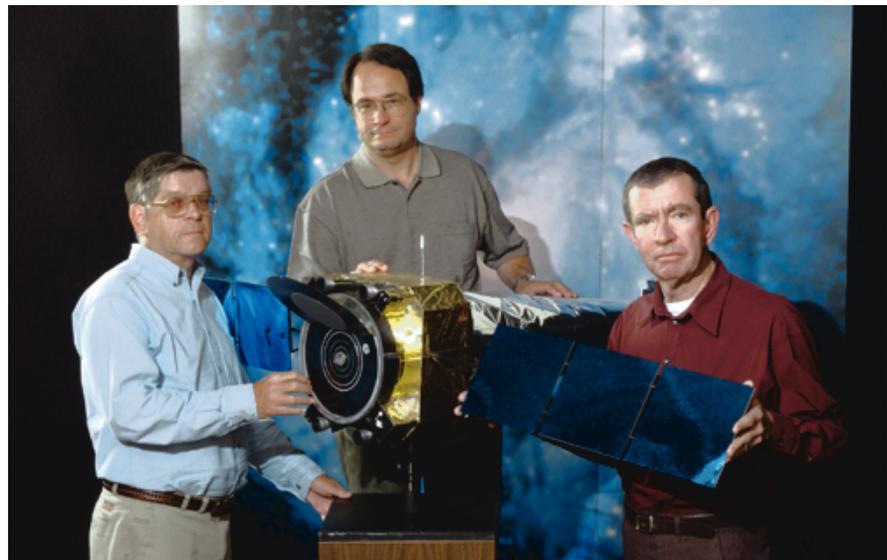


Photo by Emmett Given, NASA/Marshall Center

NASA's Chandra X-ray Observatory follows a unique orbit selected by Marshall team members, from left, Russell Stone, Steve Evans and Larry Mullins.



Photo by Doug Stoffer, NASA/Marshall Center

The 'Wright' stuff

Students at Ed White Middle School in Huntsville built a scale model of a propeller based on a design by the Wright brothers. The class is participating in the Centennial of Flight program for the Earth-to-Orbit Engineering Design Challenge sponsored through Marshall's Education Programs Department. From left, Marshall curriculum advisor Nick Haddad with students Ashley Gibbs and Catheryn Okoye inspect the model and testing unit.

'Bad bubbles,' semiconductors, new furnaces make Space Station 'hotbed' for materials research

by Tracy McMahan

Scientists will soon turn the International Space Station into a materials research laboratory to study "bad bubbles" that cause defects in metal alloys used to produce engine turbine blades and semiconductor crystals that are crucial components in electronic devices.

During the STS-111 mission to the International Space Station, Space Shuttle Endeavour delivered two novel furnaces and more than 20 ampoules filled with materials samples for the first two NASA materials science experiments conducted on the Space Station.

"We can thank advances in materials science for everything from cell phones to airplanes to computers to the next space ship in the making," said Dr. Donald Gillies, NASA's discipline leader

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Chandra

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X-ray images ever recorded and discovered a new size of black hole.

But before Chandra could achieve those firsts, “deepests” and “farthest,” long before the observatory was launched, engineers first had to determine precisely the best path for the observatory to take.

“There were several challenges to overcome,” said Larry Mullins, the aerospace engineer who led the team to determine Chandra’s trajectory – or flight path. “One challenge was the sheer height of the orbit needed.”

At its high point, two-hundred-times higher than the Hubble Space Telescope, Chandra’s orbit takes it 75,000 miles from Earth, far outside the belts of radiation that surround our planet. This radiation — while harmless to life on Earth — can overwhelm an X-ray observatory’s sensitive instruments.

During each 64-hour orbit, Chandra remains outside the radiation belts long enough to take 55 hours of uninterrupted observations. To achieve this unprecedented altitude for an orbiting satellite, the Marshall engineers crafted an elliptical, or oblong, orbit.

“It would have been simpler to create a circular orbit, but at that altitude, it was out of the question,” said Mullins, “because at its highest point, Chandra flies about 75,000 miles higher than the Space Shuttle can travel.”

A Space Shuttle flies as high as 350 miles from Earth. Even at its closest approach to Earth, Chandra’s altitude is about 6,000 miles from Earth. Space Shuttle payloads, such as Chandra,

destined for altitudes above the Shuttle’s range, have rocket motors attached. Fired after the spacecraft is a safe distance from the Shuttle, these rocket motors propel the spacecraft to its final destination.

The Chandra X-ray Observatory, with a rocket booster known as the Inertial Upper Stage, and support equipment, was the largest and heaviest payload ever launched by the Space Shuttle.

The wide variation between the observatory’s highest and lowest point from Earth is the result of the elliptical orbit designed by the Marshall Center trajectory team. To achieve this unusual orbit, rocket boosters propelled the observatory to the required altitude.

“In its simplest terms, the concept is similar to a sling-shot,” explained Russell Stone, an aerospace engineer in Marshall’s Space Transportation Directorate.

But the implementation was anything but simple. It took two years just to create the computer software that would enable the team to predict the evolution of Chandra’s orbit over its expected 10-year lifetime.

Another challenge was ensuring Chandra had nearly uninterrupted access to its power source — the Sun. Although the observatory has three batteries that store power, the Sun is the sole source of power to those batteries.

“The observatory’s battery life is two hours,” Stone said. “That’s how long it can operate on the solar power it’s collected, so Chandra can’t be in darkness for more than two hours at a time. We had to find a path that minimized its time in

Earth’s shadow.”

“We did some parameter studies and found the size and orientation of an orbit that fit all these criteria,” said Steve Evans, another member of the Chandra Trajectory team at Marshall. In fact, the engineers don’t expect Chandra to go into a shadow for more than two hours at a time for the next 10 years.

“Chandra’s orbit is so high that it doesn’t move into Earth’s shadow for every one of its orbits,” Evans added. In fact, it is infrequent enough to result in only two eclipse seasons a year, each with about a dozen eclipses.

Based on the observatory’s outstanding results, in September 2001, managers at NASA Headquarters in Washington, D.C., decided to extend Chandra’s mission from its original five-year-mission to a 10-year mission.

The extended mission will support five additional years of day-to-day operations such as controlling the spacecraft, observing celestial targets, processing the data, and passing it on to scientists around the globe. It also includes continuing the administration of hundreds of science grants for astronomers to analyze their data and publish their results.

What Chandra will discover during its additional five years remains to be seen, but thanks to the efforts of NASA engineers, there’s no mystery to the path the observatory will take while delivering its groundbreaking images to stargazers on Earth.

The writer, employed by ASRI, supports the Media Relations Department.

Marshall Center awards \$100 million contract for information technology support

The Marshall Center is continuing an existing contract with Computer Sciences Corp., of Falls Church, Va., to provide information technology services and certain services to all other NASA centers and facilities.

The contract-extension modification, valued at \$100.6 million, covers the period May 1, 2002, through April 30, 2003. It continues services under a contract entitled “Program Information Systems Mission Services (PrISMS),” originally awarded to Computer Sciences Corp., in 1994. A full and open recompetition

of the PrISMS effort will also be initiated during this period.

Work performed by Computer Sciences Corp., and its subcontractors under PrISMS includes support for NASA computer systems, applications software, telephone systems and audio-visual services. It also includes a range of services, including support of information management systems, the NASA Automated Data Processing Consolidation Center at Marshall and the NASA Incident Response Center.

The extension of this contract brings PrISMS’s total value to approximately \$1 billion since it was first awarded in 1994.

Rocket launch uplifting experience for college students

Students from the University of Alabama in Huntsville and Alabama A&M University cheered as the rocket they built -- and the scientific payload it carried -- soared two miles into the sky.

The May event culminated a year of work by the university students as part of the Marshall Center's Student Launch Initiative.

Motivating students to apply creativity to hands-on technology is the aim of the program, which teams high school and college students with Marshall engineers and challenges them to design and build reusable rockets and scientific payloads.



College participants ready the payload, which will measure the amount of hydrogen produced during electroplating with nickel when the rocket experiences a brief period of microgravity.



Photos by Dennis Olive, NASA/Marshall Center

Student Launch Initiative college participants begin fitting their rocket and payload sections together before launch.



The rocket's launch stand is secured before countdown.



Launch!



All systems go as the students' rocket and payload climb skyward.

Bubbles

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for materials science at the Marshall Center. "To improve materials needed in our high-tech economy and help industry create the hot new products of the future, NASA scientists are using low gravity to examine and understand the role processing plays in creating materials."

Bubbles are a good example of the way microgravity — the near-weightless environment created as the Space Station orbits Earth — influences the properties of materials as they are produced. On Earth when scientists melt metals, bubbles that form in the molten material generally rise to the surface, pop and disappear. In low-gravity, the bubbles may only move slightly.

Bubbles sound simple," said Dr. Richard Grugel, lead scientist for the Pore Formation and Mobility Investigation at the Marshall Center. "But when bubbles are trapped in solid samples, they show up as internal cracks that diminish a material's strength and usefulness, whether it's processed on Earth or in space."

Grugel's furnace will melt and resolidify samples of a transparent modeling material, succinonitrile and succinonitrile water mixtures.

"Bubbles are more likely to get trapped in samples processed in microgravity, which makes it an excellent place to study their movements and interactions," Grugel said. "The information gleaned from the experiments will promote our knowledge of bubble dynamics and provide needed insight regarding materials processing of metals and alloys in space."

Observing and controlling his Space Station experiment from the telescience operations room at Marshall, Grugel will scrutinize bubbles in prepared samples and study their behavior. He'll send commands to the experiment in space, changing the processing temperature and other parameters to systematically investigate the conditions that stimulate bubble movement and eventual pore formation.

The other materials science experiment to be delivered on this month's STS-111 mission — the Solidification Using a Baffle in Sealed Ampoules, or SUBSA — will study solidification of semiconductor crystals from the melt. Semiconductors are used in electronic devices such as computer chips and integrated circuits, medical imaging devices, and detectors of nuclear and infrared radiation.

For this investigation, indium antimonide crystals previously solidified on Earth are melted and then cooled to resolidify in microgravity and form solid single crystals. To control the electronic properties of the crystals, tiny quantities of tellurium or zinc is added to the indium antimonide. Indium antimonide was selected because of its relatively low melting point of 512 degrees Celsius and because it is useful for creating models that apply to a variety of semiconductor materials.

On Earth, buoyancy continuously deforms and moves fluids in complex manners, making it difficult to study how materials that solidify from the melt form semiconductors and other

products," said Dr. Aleksandar Ostrogorsky, the SUBSA principal investigator who also teaches and conducts research at the Rensselaer Polytechnic Institute in Troy, N.Y. "In microgravity, the fluids are almost stagnant, resembling solids. The absence of motion makes it easier to observe and mathematically describe what is occurring when the crystals are melted, and how the materials solidify to form a new crystal."

The semiconductor crystals are contained in cylindrical glass tubes, called ampoules, which astronauts insert into the SUBSA furnace for processing. Ostrogorsky will observe each sample as it is processed and send commands to his space furnaces — tweaking the experiment, much as he would in a ground-based laboratory.

Ostrogorsky and Grugel will each process at least 10 samples.

Ostrogorsky's samples are scheduled to be processed first and returned on Space Shuttle Endeavour when it visits the Station this fall. Grugel's experiment will begin later during Expedition Five and continue until the samples are returned on Space Shuttle Atlantis during the STS-114 mission early next year.

These experiments are possible because the two high-temperature furnaces can be enclosed inside the Microgravity Science Glovebox - a major new research facility delivered to the Space Station this month. The glovebox safely contains the materials being processed, and has a large front window with built-in gloves allowing astronauts to change out samples and perform other important tasks.

"As the launch gets closer, my students and I are getting more excited that our experiment is actually going to be one of the first materials science experiments carried out on the Space Station," said Ostrogorsky. "We have done extensive work on the ground to prepare for the experiment, and we believe that the prolonged processing times available on the Station will allow scientists to do meaningful and reproducible materials research in space," added Ostrogorsky.

The new experiments will get under way during Expedition Five on the Space Station - the next four-month research period on the orbiting laboratory that starts with delivery of these and other experiments to the Station during the STS-111 mission. The research is sponsored by NASA's Microgravity Research Program at the Marshall Center and by the Office of Biological and Physical Research in Washington, D.C.

The writer, employed by ASRI, supports the Media Relations Department.

Energy tip

Low-emissivity, or "low-e," glass has a special surface coating to reduce heat transfer back through the window. These coatings reflect from 40% to 70% of the heat that is normally transmitted through clear glass, while allowing the full amount of light to pass through. Purchasing a window with low-e glass helps reduce energy bills.

First spacewalk by American astronaut 37 years ago

Ed White took first step into space June 3, 1965

by Bob Jaques

Space Shuttle astronauts are often called upon to perform an Extra Vehicular Activity — EVA for short — or “spacewalk,” during their missions.

On June 3, 1965, an Air Force test pilot-turned astronaut named Edward H. White II became the first American to step outside an orbiting spacecraft. It was his first trip into space. White’s historic feat lasted almost 20 minutes until he climbed back inside Gemini IV to join his crewmate, James McDivitt.

An Air Force Titan rocket carried Gemini IV into space that day after a 10:15 a.m. EST launch.

While outside Gemini IV, White remained connected to the life-support and communication systems of the spacecraft by a 25-foot “umbilical cord” while maneuvering his body with a hand-held jet thruster.

Almost three months earlier, on March 18, 1965, Russian Cosmonaut Alexi Leonov became the first man to leave the safety of his capsule and conduct an EVA. Leonov’s spacewalk lasted 10 minutes while attached to his spacecraft with a 10-foot tether line.

White’s EVA lasted twice as long as the Russian EVA and he became the first human to control himself in space using a maneuvering unit. Traveling at speeds exceeding 17,500 mph, White reported very little sensation of speed as he maneuvered around the spacecraft. During his movement around the capsule, White accidentally bumped McDivitt’s window, leaving a small mark. McDivitt

wisecracked to White, “You smeared my windshield, you dirty dog. You see how it is all smeared up there?”

White enjoyed his spacewalk – radioing ground controllers, “I’m very thankful in having the experience to be first. This is fun!”

For his achievement, White was awarded the NASA Exceptional Service Medal, promoted to lieutenant colonel and given the Air Force Senior Astronaut Wings.

Three years earlier, in 1962, White and McDivitt visited the Marshall Center with a group of astronauts and were briefed on the



Photos from Marshall Imaging Services

Astronaut Ed White during America’s first walk in space, June 3, 1965

future Saturn program.

On March 21, 1966 White was selected to be part of the first Apollo flight along with Virgil “Gus” Grissom and Roger Chaffee. On January 27, 1967, during a pre-launch test of the Saturn systems at Kennedy Space Center, a flash fire erupted and all three crewmembers were killed.

On September 29, 1967, the U. S. Postal Service, for the first time in its history, designed two stamps that blended together to make one complete picture. These two stamps, called the “Space Twins”, honored White’s historic EVA.

Huntsville recognized the first Apollo crew by naming schools in their honor — Chaffee Elementary School, Virgil Grissom High School and Edward H. White Middle School.

The writer, employed by ASRI, is a Marshall Center historian.



Seated, from left, James McDivitt and Ed White, with other astronauts, during a 1962 visit to the Marshall Center.



The historic “Space Twins” stamp issued in 1967 by the post office to commemorate Ed White’s space walk in 1965.

Madison students win first place in NASA competition

by Jonathan Baggs

A group of Madison students at Heritage Elementary School recently won first place in their division of the "NASA Student Involvement Program" competition.

The fourth-grade class, led by Wendy Tibbs, the school's enrichment specialist, was part of nearly 3,500 students from across the nation that participated.

The student involvement program links students in grades K-12 directly with seven NASA centers with competitions for different grade levels. Students develop science inquiry skills, learn to work as a team, apply computer and Internet skills and learn core concepts of Earth and space science -- integrating these with mathematics, technology and geography concepts.

For their "My Planet Earth" competition, Heritage students studied a wetlands area on school property in October and continued through January. They identified and described features and creatures of the air, land and water at the site. Their observations were combined to show how the site undergoes changes and supports life.

NASA research scientists have learned that the Earth shows different faces and tells different stories when it is observed and described from many perspectives.

Judges from Stennis Space Center, Miss., which sponsored this particular competition category, chose Heritage's entry as the best. For their efforts, students received a medal during a special NASA program at their school.

The writer, employed by ASRI, is the editor of the Marshall Star.



Heritage Elementary School fourth-graders explore the wetlands area at their school.

Photos by Emmett Given, NASA/Marshall Center



NASA Student Involvement Program first-place winners, front row, from left, Chandler Reynolds, Ross Spears, Alex Roman, Laura Proffitt, Shayla Olson and Trey Lee. Back row, from left, Teacher Wendy Tibbs, Travis Foust, Amun Jarzembki, Nicholas Miller, Daniel Downs, Ivy Corron and Samantha Woelke. Not pictured is Theresa Cordier.

Job announcements

MS02D0056, AST, Technical Resources Management. GS-801-07/09/11, Space Shuttle Projects Office. No closing date.

MS02C0130, Program Analyst. GS-343-13, Space Transportation Directorate, Business and Administrative Office. Closes June 7.

MS02D0131, AST, Technical Resources Management. GS-801-14, Second-Generation RLV Program, Program Planning and Control Office. Closes June 7.

MS02C0141, AST, Solid Propulsion Systems. GS-861-14, Space Transportation Directorate, Vehicle and Systems Development Department, Engine Systems Engineering Group. Closes June 10.

MS02C0142, AST, Liquid Propulsion Systems. GS-861-14, Space Transportation Directorate, Vehicle and Systems Development Department, Engine Systems Engineering Group. Closes June 10.

MS02C0139, AST, Electrical Systems. GS-850-14, Engineering Directorate, Avionics Department, EEE Parts & Packaging Group. Closes June 10.

MS02C0140, AST, Electrical Systems. GS-850-14, Engineering Directorate, Avionics Department, Avionics Systems Group. Closes June 10.

MS02N0136, AST, Aerospace Flight Systems. Lateral reassignment in the GS-13 level only. GS-861-13, Flight Projects Directorate, Flight Systems Department, External Carriers Group. Closes June 11.

MS02N0137, AST, Aerospace Flight Systems. Lateral reassignment in the GS-14 level only. GS-861-14, Flight Projects Directorate, Flight Systems Department, External Carriers Group. Closes June 11.

MS02N0138, AST, Mission Operations Integration. Lateral reassignment in the GS-14 level only. GS-801-14, Flight Projects Directorate, Flight Systems Department, External Carriers Group. Closes June 11.

MS02C0129, AST, Structural Mechanics Team Lead. GS-861-14, Engineering Directorate, Structures, Mechanics and Thermal Department, Strength Analysis Group. Closes June 12.

MS02C0145, AST, Navigation, Guidance & Control Systems. GS-861-14, Space Transportation Directorate, Vehicle & Systems Development Department, Control Systems Group. Closes June 6.

MS02C0146, AST, Liquid Propulsion Systems. GS-861-14, Space Transportation Directorate, Vehicle & Systems Development Department, Vehicle Subsystems Engineering Group. Closes June 12.

Center Announcements

Huntsville Stars tickets available for Marshall team members

The annual "NASA Goes to the Stars" event is June 17 and free tickets to Marshall team members are available at the NASA Exchange, Bldg. 4203 cafeteria and the Wellness Center. Each ticket will admit four. The Huntsville Stars baseball team will play the Chattanooga Lookouts at 7:05 p.m. at Joe Davis Stadium in Huntsville. The first 2,000 children attending the game with a parent or guardian will receive a free coloring book. One hundred free upper box seats are available on a first-come, first-serve basis for Marshall team members who come by the Government and Community Relations Department, Bldg. 4200, Room 828. For more information, call Cate Phillips at 544-3828.

'Freedom to Manage' in place for employee suggestions

As outlined by Administrator Sean A'Keefe, NASA has begun the "Freedom to Manage" program to remove barriers to effectiveness and efficiency present in the Agency. Impediments of any kind are open to examination, analysis and possible elimination in this program. A Web site where employees may suggest ideas to eliminate barriers is at <http://f2m.nasa.gov/>

University scholarships available

Two university scholarships sponsored by the Marshall Association are available for incoming freshmen in September. Both technical and non-technical scholarships will be awarded. The Association will accept applications for the scholarships until July 31. Completed applications should be submitted to Cliff Bailey in CD20 or call 544-5482.

Thrift Savings Plan for Marshall employees open

Marshall employees can change their contributions to Thrift Savings Plan accounts until July 31. Employees also may begin contributions to their accounts during this period. Those electing to enroll

or increase funds in the plan can obtain a TSP-1 Form from www.tsp.gov. There are five different funds to choose from. For more information, call Ginger Martin at 544-5654 or Debbie Allen at 544-7536.

Marshall Retirees Association offering university scholarship

Students who are descendants of a Marshall Center retiree can apply for the NASA-MSFC Retirees Association Scholarship at the University of Alabama in Huntsville. The \$1,000 scholarship will be awarded for the academic year beginning in the fall. To be eligible, the student must be a direct descendant of a Marshall retiree or a direct descendant of a member of the NASA-MSFC Retirees Association. Qualifying students also must be an entering freshman enrolling full-time at UAH and majoring in engineering or the physical sciences. The award is based on academic merit, citizenship, leadership and a demonstrated interest in space-related engineering or science. For more information, call UAH Student Financial Services at 824-2755.

Marshall cafeterias closed July 5

Cafeterias in Bldg. 4610, 4203 and 4471 will be closed July 5.

Federal Mail Handlers rep at Marshall on Monday

The Federal Mail Handlers Health Insurance representative will be at Marshall on Monday from 1 p.m.-3 p.m., Bldg. 4200, Room 329.

Slots available for 'scheduling fundamentals' class

A few slots are still available for the "Introduction to Scheduling Fundamentals" class. This is the last time this class will be offered this year. The class is from 8 a.m.-noon June 13, Bldg. 4200, Room G-13-E. Registration is via AdminSTAR or contract employees can call Janie Moyers at 544-7552.

Registration open for seminar on 'Competitive Strategy'

The Self-Study Learning Center has opened registration for the "Strategy in the New Competitive Landscape" seminar. The seminar will air from 10 a.m.-11:30 a.m. CDT on Marshall Continual Learning Channel 14. Discussions will focus on value creation and the influence of a changing competitive landscape including deregulation, technological and industry convergence such as digital photography, emerging markets and the Internet. Managers must learn how to rapidly learn to understand and compete in this new environment. To register, e-mail your full name and phone number to self.study@msfc.nasa.gov.

NASA Performance Evaluation Profile Survey required

All Marshall team members, civil service and contractor, are required to complete the Performance Evaluation Profile Survey. A training module is at the Safety, Health and Environmental Web site. The training module can be completed in about one hour. For assistance, or for more information, call Dennis Davis at 544-8628, or Kristie French at 544-7474.

IEEE Huntsville Section meeting June 12

The IEEE Huntsville Section meeting is from 11:15 a.m.-1 p.m. June 12 at the Piccadilly Cafeteria in Madison Square Mall. Joanne Randolph, president and chief executive officer of BizTech, Huntsville's Technology Incubator, will discuss several strategies for starting a successful business. For reservations, call Sonya Hutchinson at 544-3312.

Six Sigma workshop set

The Six Sigma Champion's Workshop "Topics in Engineering" course is open for NASA managers, systems engineers, quality control personnel and designers. To register, complete an APPL Nomination Form and submit it to Jerry Miller in CD20. For more information, call Tina Smith at 544-7834.

Employee Ads

Miscellaneous

- ★ Magnavox stereo, 54" wide, dark maple finish, \$40; bed rails for double bed, \$10. 837-6776
- ★ MTD chipper/shredder, 5HP, \$250. 830-4846
- ★ Baby clothes for girl, size 18-24 months. 776-0425
- ★ Brunswick pool table, 1" slate w/overhead "Bud" light, 2 cue stands, cues, balls, \$1000. 256-837-6879
- ★ Sound design, 8 track w/radio, 8-track tapes; also available tapes, \$.50; amplifier, \$10. 881-8648
- ★ Single waterbed, honey maple w/brass trim, includes heater, comforter, and bedding, \$150. 859-0729
- ★ Black vinyl sectional sofa, 5-piece black lacquered dinette, end tables, coffee table, \$899. 837-6518
- ★ Roping saddle, \$350; two youth saddles, \$125 each. 259-5140
- ★ Flat bottom boat under 14', suitable for 30HP motor. 5446957
- ★ Pair of MTX truck speakers, 8" woofer, horn tweeter, \$45. 732-4759
- ★ Women's golf clubs; 10 MacGregor irons, \$25; 4 Hagen woods, \$25; Black bag, \$30. 533-4824
- ★ Retired carpenter tools for sale: compressors, nail guns, saws, etc. 256-859-4140
- ★ Wedding gown w/train/veil, size six, \$250; red evening gown, halter, size 5, \$75. 881-8674
- ★ Kitchen Aid washer and Kenmore dryer, white, \$200. 828-3181
- ★ Pneumatic framing nailer & stapler; 18-volt portable saw/drill; paint sprayer kit; 1-year old. 325-0060
- ★ Nokia 5190 digital phone, dual mode, \$20; Rotary reel mower, 3HP, 2-grass collectors, \$350. 325-6000
- ★ Bassett honey oak crib, \$150; double jog stroller, In-Step ZII, \$165. 882-2076
- ★ Bassett cherry dining room suit: includes china cabinet, buffet, 6-chairs, table, & three 12" leaves. 881-0883
- ★ Living room set, 3-piece sectional, 12 small matching pillows, earth-tone, seats 6-8, \$1,200 obo. 772-6469/683-6469
- ★ Pool table, full size, 1 piece/1" slate, commercial type with accessories. 430-0549
- ★ Diamondback 20" Joker trick BMX bike, black, \$220 new, asking \$145. 533-5942
- ★ Utility trailer with expanded metal tilt bed. 8' x 4', 12" tires, \$200. 216-8868

- ★ 1973 Moto Guzzi El Dorado 850 motor cycle, \$3200 obo. 880-2990/Mick
- ★ Two 1991 Yamaha VXR 650 jet-skis on galvanized double trailer w/tool box & spare tire, \$3,400. 464-9232
- ★ Fiberglass truck bed lid for 1997 Chevy, ext.-cab, standard-bed, white, deliver Huntsville/Decatur area, \$300. 340-9450
- ★ King waterbed mattress soft-sides w/heater, \$35 obo; 24" cedar post platform, \$45 obo. 828-6213
- ★ Rogue bass guitar practice amp, 20-watt, \$60; VOX bass guitar amp, 25-watt, 1-year old, \$130. 830-4389
- ★ Ohio state quarters w/Denver Mint mark, one box (50 rolls), \$800 firm. 256-859-1877
- ★ Window air conditioner unit, works, \$100. 430-0549
- ★ Wheel Horse riding mower, 12.5HP, 37" deck, hydro-transmission, 336 hrs., \$850. 830-6584
- ★ Playstation 2, DVD remote, 4-games, 2-controllers, \$265 obo. 489-0136
- ★ Whirlpool self-cleaning electric oven/range, \$150; side-by-side refrigerator w/ice in door, \$225. 536-4507
- ★ Headboards: one king, one queen, wood, large size intricate pattern, dark stain, \$175 each. 256-726-0211
- ★ Baldwin upright piano, needs felting and tuned, \$150. 882-7054

Vehicles

- ★ 1998 Bonneville, leather, all-power, ABS, AC, CD, comprehensive breakdown insurance, one-owner, 67K miles, \$10,000. 536-8925
- ★ 1989 Legend, all-power, Kenwood CD, new clutch, brakes & battery, non-smoker, 200K miles, \$2,500 obo. 536-8925
- ★ 1991 Ford F150 XLT Lariat, auto, tan, camper shell, low mileage, \$4,500. 256-859-4140
- ★ Mazda RX7-R2, red, leather, 5-speed, sunroof, \$14,000 obo. 885-1788
- ★ 1992 Camaro RS, 105 K miles, V6, purple, PW, PDL, cruise, AM/FM cassette, \$3,200. 931-6991
- ★ 1987 Mercedes 190E, auto, 107K miles, sunroof, new tires, \$2,990. 961-9533/325-7920
- ★ 1988 Delta 88 Oldsmobile, white, 4 dr., loaded, needs few repairs, asking \$1,300. 882-9695
- ★ 1990 Chrysler New Yorker Salon, V6, auto, air, CD, sunroof, full-power, loaded, \$2,100. 851-9519
- ★ 1997 Chevy Blazer, 4.3L Vortech V6, keyless entry, loaded, green/tan w/tan interior, 135K miles, \$6990. 828-3668
- ★ 1997 Ford Ranger XLT, 5-speed, 55K miles, am/fm/cassette, bedliner, alloy wheels, garaged, \$4950 firm. 753-2278
- ★ 1992 Maxima, one-owner, a/c, new tires &

- brakes, 23 MPG, 166K miles, \$3,550 obo. 650-5895
- ★ 1993 Infinity J30, loaded, 166K miles, new tires & brakes, \$4,500. 256-498-0219
- ★ 1994 Honda Accord LX, 51K miles, maroon/gray interior, automatic, am/fm cassette, asking \$8,500. 895-9589
- ★ 1991 Ford Lariat 150 XLT, low mileage, auto, camper shell, \$4,500. 859-4140
- ★ 1999 Corvette Coupe, red w/black leather interior, loaded, both tops, auto, extended warranty, 21K miles, \$31,000. 325-3038
- ★ 1996 Plymouth Neon HL, 93K miles, 4-door, a/c, AT, \$2,800. 883-7039
- ★ 1978 Chevrolet Monte Carlo, 305 engine, 116K miles, \$1,850. 881-2355/881-9593
- ★ 1991 Toyota Celica ST, 5-speed, maroon w/gray interior, 145K miles, \$3,200. 880-9025
- ★ 1996 Ford Windstar LX, 91K miles, non-smoker, loaded, white/gold/tan, \$6,995. 325-7542
- ★ 2000 Chrysler LHS, power-roof, radio, chrome wheels, full-size spare, 36K miles, \$18,300. 837-5874
- ★ 1996 Millenia, sunroof, all-power, Alpine CD changer, 80K miles, champagne/gray interior, \$8,500. 880-9025
- ★ 1994 Chevy S-10 Blazer, 4WD/LT, one-owner, \$6,750; 1992 Firebird Formula, 8-cyl., T-tops, one-owner, \$5,250. 653-0406
- ★ 1993 Chevrolet Beretta, auto, a/c, 95K miles, \$2,250 obo. 852-7871
- ★ 1990 Pathfinder SE, two-door, red, manual 5 speed, 4WD, 166K miles, new tires, \$4,200. 256-864-3133
- ★ 1994 Jeep Cherokee Sport, 2WD, 2-door, 90K miles, \$4,500. 256-325-6266

Wanted

- ★ To borrow or copy software for a NASA Property HP Scanjet ADF C6265A scanner. 544-1998
- ★ First day issue stamps on envelopes and cards. 881-6595
- ★ Lenox china, Springdale pattern, place settings, serving pieces, etc. 256-232-5552
- ★ 100th Shuttle mission bookmark. 256-306-0700

Found

- ★ Glasses in the 4200 Mail room, call 544-3623 to claim/identify.

Free

- ★ Golden retriever/chow mix, loveable, playful, good/children, fetches, gives "high five", shakes, housebroken/crate trained. 721-1057
- ★ Kittens: calicos, solid white, gray, 6 weeks old. 852-0799

Lost

- ★ Gold bracelet in or around Building 4203. 544-9597 to claim/identify

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