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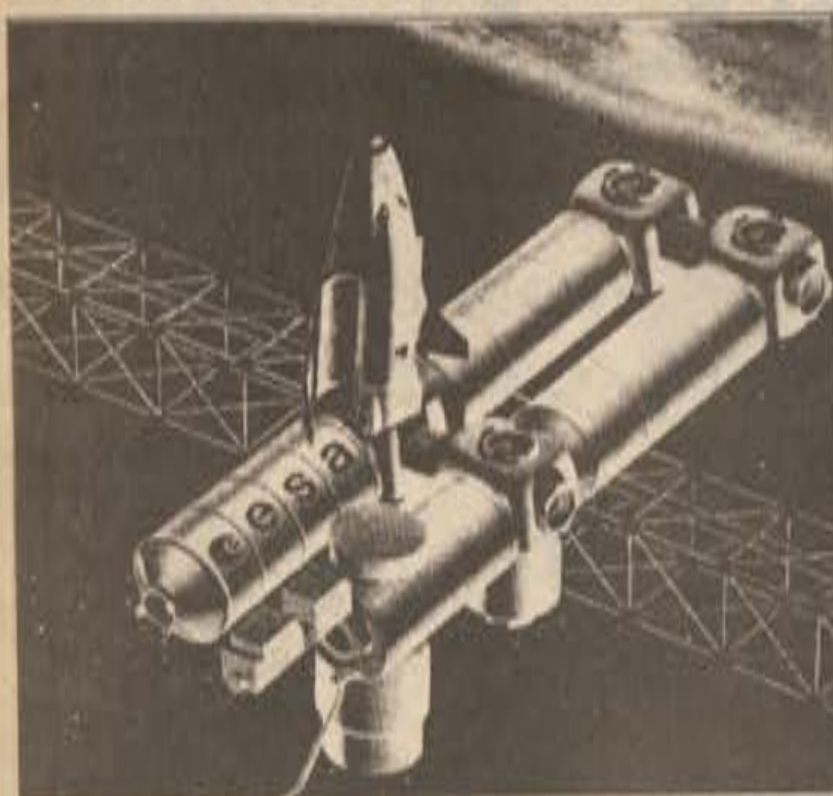
## Space Technology

B

Volume 67, Issue 2

September 19, 1990

### Columbus will bring Europe into the Space Station era



by Roland Houle  
 Space Technology Writer

The Columbus research module, the European Space Agency's (ESA) contribution to Space Station Freedom, will give ESA experience in large cooperative ventures with the United States.

Columbus comprises three separate elements: an attached laboratory, a free-flying lab and a polar platform. The program objective is to provide space and ground facilities to support the European and international users.

The technology for Columbus is closely linked with other ESA projects, such as Ariane 5, the European Data Relay Satellite and the Hermes spaceplane.

The Columbus attached laboratory will be permanently affixed to Freedom's manned base. This thirteen foot diameter lab will harbor equipment for materials sciences, fluid mechanics, and compatible life sciences missions.

The lab will be built for the crew to perform experiments in a shirt-sleeve environment.

All necessary subsystems for the payload services and life support are accommodated under the floor and in standard equipment racks. Also, a scientific airlock for small experiments that require exposure to the space vacuum is provided.

The Columbus attached laboratory will be launched from Kennedy Space Center, removed from the space shuttle, and housed at Space Station Freedom's manned base.

The Columbus free-flying laboratory, named the Free-Flyer, will be in a microgravity maximized orbit, coplanar with that of Freedom and at nearly the same altitude. It will hold automatic and remotely controlled payloads, primarily from the materials sciences and technology fields.

The pressurized module will accommodate payloads, and an unpressurized resource module will house the main utilities and services required by the payloads and the Free-Flyer.

The composite vehicle, which is about forty feet long, fourteen feet in diameter and weighs about 48,400 pounds when fully outfitted, will be launched by an Ariane 5 launcher from the Centre Spatial Guyanais in Kourou, French Guiana.

The module will be routinely serviced by astronauts aboard the Hermes spaceplane every six months. However, this service will be provided at Freedom, which the Free-Flyer is scheduled to visit every three to four years for major external maintenance.

The final portion of Columbus will be an unmanned polar platform that will fly in sun-synchronous polar orbit. It will be used primarily for Earth observation missions in conjunction with one or more similar platforms by NASA and other international partners.

It is designed to last four to six years and will orbit between 434 and 527 miles. It will be launched by an Ariane 5.

ESA launched the program concept in the early 1980's, and fueled with the success of Spacelab, it completed the design, definition and technology preparation in 1987. The Columbus development phase, which began in 1988, will take ten years to complete, culminating with the initial launch of the three elements.

Currently, however, ESA has showed signs of losing patience with America's wavering commitment to the space station project. At an international meeting this summer, the agency announced that it is investigating preliminary designs for an independent space station.

The European Space Agency has established itself as a workhorse in the space business. During the past decade, its accomplishments include the 1986 Giotto mission to Halley's Comet and the successful Spacelab program, part of which will be aboard the Space Shuttle Columbia's mission of STS-35.

Also, ESA has managed to corner over one-third of the free world's market for commercial satellite launches.

The fourteen nations that comprise the consortium are Belgium, Denmark, France, Austria, Italy, the Netherlands, Ireland, Spain, Sweden, Switzerland, the United Kingdom, the Federal Republic of Germany, Norway and Finland.

The European Space Agency's (ESA) Columbus program will provide international researchers with an attached laboratory, a man-coded Free Flyer, and a polar platform.

#### Interesting concept...

The Columbus research module, shown here, will be the European Space Agency's (ESA) contribution to Space Station Freedom.

### Hubble continues to provide astronomers with remarkable images

by Joshua S. Mussat  
 Space Technology Writer

NASA's Hubble Space Telescope, a cooperative program with the European Space Agency, continues to provide scientists with remarkable images from space, even with the defect in the primary mirror. The results being obtained promise that astronomers will be able to use the Hubble Space Telescope to probe the mysterious centers of galaxies, in search for massive black holes.

On August 17, the Wide Field and Planetary Camera

took an image that provides a detailed view of the core of a galaxy which lies 40 million light-years away, more than half way to the great Virgo cluster of galaxies.

The image reveals that stars are much more tightly concentrated at the center of the galaxy than was previously expected. Because the galaxy, cataloged as NGC 7457, is assumed to be a "typical" galaxy these preliminary findings suggest that the nuclei of normal galaxies may be more densely packed with stars than previously thought.

HST scientists are greatly encouraged by this new observation, and emphasize that it demonstrates intriguing science can be routinely accomplished with the spaceborne observatory.

The centers of galaxies are extremely interesting to astronomers because they are at the heart of violent processes that give rise to cosmic jets, Quasars, Seyfert galaxies and other mysterious energetic behavior.

NGC 7457 is a quiescent galaxy, located forty million light-years away, that was picked for its "normality" as an early target for assessing the science performance of HST.

It is far from clear whether or not a massive black hole is at the center of NGC 7457, because the images alone do not provide the answer. But these new data suggest that

NGC 7457 is an excellent place to use the HST's spectrographs to measure how much mass is concentrated at the center of the galaxy.

On August 23-24, observations were made with the European Space Agency's Faint Object Camera, which have provided unprecedented sharpness and clarity down to .1 arc second, an intriguing view of a supernova and its surrounding shell of stellar material.

The observations made displayed a dramatic new look at the remnants of one of the most spectacular and unexpected astronomical events of this century, the great supernova of 1987.

The image, taken in visible light, reveals the details of the circumstellar shell, whose characteristics had been previously suggested by ground based observations and data from the International Ultraviolet Explorer satellite.



Amazing...

This image taken by the Hubble Space Telescope's Faint Object Camera shows the mysterious gaseous ring around Supernova 1987A.

This new image will provide important insights into the evolution of massive stars and their catastrophic deaths as supernova explosions.

The visible light image clearly shows an elliptical, luminous ring of gas about 1.3 light-years across surrounding the still glowing center of the 1987 explosion. In the first few hours following the supernova blast the

ring was fully ionized and heated by a flood of ultraviolet radiation. Three and a half years later, the ring still glows at a temperature of more than 20,000 degrees Kelvin.

It is hoped with these promising observations, the Hubble Space Telescope will provide NASA and the European Space Agency images that will help solve the mysteries of our universe, and lead us to our origins.

### Space News...

**Vandenberg Launch Complex gets a new owner...** The Air Force has awarded Lockheed Space Operations Co. a contract to convert the mothballed space shuttle complex at Vandenberg AFB, Calif. to a Titan launch facility. The Air Force was going to use the complex in California to launch Department of Defense (DOD) space shuttle missions. The contract cost well over \$82 million and the complex will be used to launch Titan IV and Atlas Centaur rockets. The California site was abandoned after the Challenger Accident. The work is expected to be completed in 1997 with a growth capability for the next generation of heavy lift space boosters.

**Endeavour to the rescue...** Endeavour's first mission will be used to rescue the Intelsat satellite after it was placed in a useless orbit last March. The Titan rocket left Intelsat in a 345 mile high orbit when the rocket failed to deploy the satellite. The satellite was supposed to fire its engines after deployment and this would have carried the satellite to its planned 22,300 mile orbit. The early 1992 shuttle flight will rendezvous with the satellite, capture the satellite with the space shuttle's Remote Manipulator Arm or robot arm and then attach a new 20,000 pound booster rocket. This will enable the satellite's rocket engine to boost it to its proper orbit. Another rescue like this occurred in April 1984 when George "Pinky" Nelson (now retired from NASA) and James "Ox" Van Hoften repaired the Solar Max Satellite during a space walk. Many rescue missions followed that mission and many more may be needed in future space shuttle missions.

**New technology on the Moon...** McDonnell Douglas Space Systems Company has completed an initial phase of a project to develop solar energy applications on the lunar surface. This is all part of the project initiated by President Bush's Space Exploration Initiative (SEI). The test simulated the use of sunlight to melt crushed grey basalt (substituting for lunar soil) into a black liquid around 2200 to 2400 degrees Fahrenheit. After the liquid cooled it formed into a black shiny glass and occasionally flexible fibers. These materials can be processed again and used for construction of composite structures on the Moon. By doing this, it will reduce the need for materials from Earth. It will use reflected sunlight to melt lunar soil into glass and glass fibers. The development of the solar concentrator mirror by McDonnell Douglas has enabled them to focus 75 kilowatts of the Sun's energy into 10,000 times its normal intensity. The use of solar energy is more efficient on the Moon than it is on Earth. This is due to the lack of an atmosphere on the Moon. Since there is no atmosphere on the Moon, 40 percent more sunlight reaches the surface and the solar collectors. Also, the lack of wind and low gravity enables engineers to design light weight structures. The use of this kind of technology on the Moon will enable future inhabitants of the Moon the freedom to do more than on the Earth.

### Ames-Dryden to test shuttle drag chutes

by Melissa Wolfe  
 Space Technology Writer

Ames-Dryden has developed a drag chute braking system to supplement the braking system currently installed on the space shuttles. The chutes are designed to be used on ground landings and are not like the Apollo spacecraft's parachutes. These chutes will increase the usability of the shuttles by cutting down on the wear and tear of the current tire and braking system.

Gordon Fullerton will pilot the B-52 mothership used to deploy the drone equipped with the chute system from altitudes up to 40,000 feet. Fullerton flew on two space shuttle missions and is currently a test pilot for Ames-Dryden. In 1977, Fullerton also participated in a landing test with the shuttle prototype, the Enterprise.

The chutes are four feet smaller than the current

**The drag chute will cut down on the wear and tear of the current braking system.**

B-52 chutes and will be deployed from unmanned aircraft which are dropped from the mothership. Instruments will monitor the deployment of the chutes along with cameras attached to the system. To compensate for the added weight, Boeing has reinforced the tail section of the B-52.

Eight landing tests are scheduled to be performed at Ames-Dryden. The B-52 aircraft was selected as the test aircraft due to the range of land-

ing speed similarities to the landing speed of the shuttle.

The B-52 is the oldest type of test aircraft being used today. The B-52 was the launch aircraft for the X-15 flights; as well as the Pegasus air-launched space booster. The B-52 participated in 161 captive-carry flights during the X-15 project. Rockwell International is currently at work building the newest shuttle, the Endeavour, which will be ready for flight next year with the drag chute system installed.

The remaining shuttles will also be fitted with the chute system. NASA is managing the program from Johnson Space Center in Houston. Rockwell International is participating in the program for the design of the drag chute system. Boeing Airplane Company is also participating in the program for the modifications to the B-52.



Retired?...

The B-52 aircraft (shown), will be testing the drag chutes that will eventually be adapted to fit the space shuttle.

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# US Navy commences SLAM missile launch testing

By Dan Moughamian  
Aeronautics writer

On June 26, 1990, the United States Navy successfully launched a SLAM missile from one of its surface ships for the first time.

The new missile, which is built by McDonnell Douglas, St. Louis, is a derivative of the now operational AGM-88 Harpoon anti-shiping missile. SLAM, or Stand off Land Attack Missile, was initially tested from F/A-18 and A-6 carrier based aircraft.

It was determined, however, that surface ships could gain the same surgical strike/target discrimination capabilities if they also used the SLAM missile.

This first test was carried out from the USS Lake Champlain, which is a guided missile cruiser. The SLAM missile itself was launched from a Harpoon canister and was guided by the same system used with the Harpoon.

The test was conducted at the Pacific Missile Test

Range at Point Mugu, California. After firing and initial guidance from the Lake Champlain, terminal guidance was directed from a LAMPS Mk. III helicopter.

The Air Tactical Officer on board received video images from the SLAM's infrared imaging seeker, which was taken from an AGM-65 Maverick missile. The ATO was able to pinpoint the target and lock on successfully. The image transfer was possible because of a Walleye data link pod on board the helicopter. The same image was also down linked from the LAMPS Mk. III to the Lake Champlain's C.I.C., or Command Information Center. This made allowance for ship board viewing of the missile's flight

**SLAM has the ability to hit targets with great precision, from ranges in excess of fifty nautical miles.**

and, would be critical in wartime as the ship's captain would need and be able to make a positive target identification when friendly ships are in the vicinity.

During the SLAM's demonstration flight, the missile flew what is known as a target-of-opportunity mission.

In such a scenario, the missile flies toward the target, and, at a predetermined time, its infrared maverick seeker scans for the target. The SLAM then sends flight information and video imagery to the controlling aircraft for target lock on.

The test has proven the SLAM's ability to be launched from Harpoon-capable ships, and it's ability to be controlled from LAMPS Mk. III helicopters, which are deployed aboard all Navy surface action ships. Target-of-opportunity was also proven as one of the missile's capabilities.

Being a descendant of the Harpoon missile, which is built by McDonnell Douglas as well, SLAM makes use of the AGM-88's airframe, propulsion, and control systems.

The missile's guidance systems are not new either, though they are current.

These consist of a Rockwell-Collins GPS, a Maverick infrared seeker, and a Walleye data link.

All this gives SLAM the ability to hit targets with great precision from ranges in excess of 50 nautical miles.

The first production SLAM was delivered to Navy air wings in 1988.



Slamming... The first test of the new McDonnell Douglas Standoff Land Attack Missile (SLAM) occurred from the deck of the USS Lake Champlain.

## Northwest/Eastern merger proposed

by Joe Cambron  
Managing Editor

Northwest Airlines is now contemplating a merger which could again change the face of air travel amongst the major airlines. Troubled Eastern Airlines is now vying to become Northwest's second merger partner in the last few years. If the merger were to take place, Northwest's new owners, investor Alfred Checchi and company, would preside over what remains of such airlines as Republic, Southern, North Central, Hughes Airwest, Bonanza Airlines, and now Eastern.

A merger, however, is only favored by Eastern management. Northwest newly indoctrinated management team is primarily concerned with the purchase of Eastern assets such as its aircraft and terminal facilities.

As a result, this kind of deal would have a decidedly negative impact on several groups, with the marked exception of Eastern's creditors. Among the losers would be all



**Targeted...**  
Eastern is the target of a Northwest takeover.

The many thousands of remaining Eastern employees.

Not eager to stir up Northwest's slumbering union woes, Checchi believes the only viable combination of the two airlines would be one with exclusively Northwest's employees.

If either event takes place, it appears that one sure loser will be the city of Memphis, Tennessee. Northwest spokesman have recently said that "we are not at all secure with our future in Memphis." This statement looms above the company's ever-shrinking hub in that city.

Eastern's Atlanta hub would almost certainly be a replacement for their Memphis operation.

## Old jet sees new technology

by Hoyt E. Brown  
Aeronautics Editor

After 18 years in the desert retirement, Boeing's prototype 707, known as the Dash 80, is once again the testbed for new technology that could change the commercial aviation -- as well as the environment.

Boeing technicians are stripping away coats of paint oxidized during the Dash 80's nearly two decades of storage in the Arizona desert. But instead of a highly toxic paint stripper, the technicians are using tiny dry ice pellets.

It normally takes more than 335 gallons of toxic methylene chloride to strip a plane the size of a 707 and each drop has to be collected, stored and properly disposed of at a cost of about \$800 a barrel.

The dry ice stripping method tested on the Dash 80 is marketed by Cold Jet Inc. of Cincinnati, Ohio. It uses carbon dioxide pellets the size of pencil erasers that are sprayed under pressures on the painted surfaces. The dry ice freezes the paint, but not the aluminum skin, thus breaking the bond that held the paint to the surface.

The only residue is paint chips that fall to the floor where they are collected with a broom and dustpan for disposal.

"We think this process holds a lot of promise," said Gary Horton who supervises the Dash 80 restoration. John Richards, another Boeing employee, agrees.

"We were testing the (stripping) system at another location on the interiors of wing fuel tanks when heard about the Dash 80 restoration. It just seemed like a good opportunity to test the dry ice method on a whole airplane,"

Richards said.

Darrell Smith manages the operations in the enormous hangar where the Dash 80 work is done. "We couldn't use paint stripper in here because we have no way to handle the residue," he said. Smith added that, "We were all set to use hand strippers. Otherwise, we would have to fly the plane to another Boeing facility that has a paint hangar. Then we would have to figure out how to get the work done without disrupting their production schedule."

"One of the good things about this method is that it can be done in an open area like this," Smith said.

Boeing is restoring the Dash 80 to its original condition be-

cause it is considered one of the twelve most important aircraft of all time. The forerunner of every Boeing jetliner built, the Dash 80 is an experimental aircraft used during its 18 year career to test hundreds of different components and systems that later became standard on production models. For Boeing employees, working on the Dash 80 is a labor of love.

After the Dash 80 is completely stripped, Boeing will analyze the cost of the dry ice method and compare the findings with standard stripping methods using toxic liquid chemicals.

Richards said that if the comparison shows the kinds of economic value he and others think it will produce, dry ice stripping will become another tool in the company's efforts to reduce the hazardous materials it uses to build its airliners. And the Dash 80 will have earned another addition to its already impressive list of contributions to aviation history.

**The forerunner of every Boeing jetliner built...It is considered one of the twelve most important aircraft of all time.**

## Collins TCAS II FAA approved

by Hoyt E. Brown  
Aeronautics Editor

The Collins Air Transport Division of Rockwell International Corporation has announced that FAA TSO approval has been received for its Traffic Alert Collision Avoidance System (TCAS II).

Over 3000 Collins TCAS II systems are currently on order. The sys-

tem consists of the TTR-920 Receiver/Transmitter, the TPR-920 Mode S Transponder, TTC-920 TCAS/Transponder Control Panel, and the TRE-920 Directional Antenna.

A variety of display options are also available. The system received initial Supplemental Type Certification aboard a company Sabliner;

however installations will eventually be completed aboard more than 40 aircraft types, including the Con-

corde. Collins TCAS requires no forced air cooling, and the system weighs a mere 55 lbs. It has been designed to accommodate the complex growth requirements of TCAS III without hardware changes.

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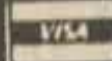
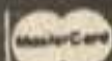
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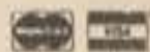
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# Cinemaware blasts into the past with *Rocket Ranger*

by Jason Simon  
Data-Tech Editor

Once again, Cinemaware brings a winning entertainment package home with the release of *Rocket Ranger*. *Rocket Ranger* is the story of a World War Two aerospace engineer, you in the game, turned superhero. The setting: World War II; Hitler's regime is taking over the planet. The reason, Hitler and his Nazi war machine are receiving help, not from Italy, but from Aliens based on the moon. These Aliens mine Lunarium which the Nazis turn into Lunarium bombs. These bombs are capable of turning the general populace of the world into mindless zombies.

The player, who plays the role of the aerospace engineer, is first found sitting in his lab, designing a bombsight for new allied fighters. All of a sudden, a strange light envelopes the engineer's desk and strange forms materialize out of the light. The forms turn out to be a rocket pack, lunarium gun, wrist surveillance device and secret decoder wheel. The package also contains a note. The note is from one hundred years in the future. It states that the Nazis have taken over the planet, and it was a mistake. The only person that can save this planet is you, for you are now Rocket Ranger.

The game starts off with a message that states that the Nazis have used a Zeppelin to kidnap the top physicist in the nation, Otto Barnstorff and his daughter, Jane. If the Zeppelin reaches Germany the Nazi's ability to produce lunarium will increase dramatically; this will allow the Nazis to take over the world faster than expected. Rocket Ranger's first mission is to rescue the Barnstorffs by knocking out the Nazis in the Zeppelin's gondola. This, however, is no easy task since the lunarium gun's ammunition, which is used to solve this part of the mission, will cause the Zeppelin to explode if the player hits anything except the one centimeter area which represents the gondola; on a Zeppelin that takes up almost the entire playing field. To make matters worse the Zeppelin fires rockets at the player which will knock him out of the sky if they are not avoided.

Even if the player is lucky enough to knock out the gondola, the mission does not end there. First Rocket Ranger must convince the Barnstorffs that he is a friend and not a Nazi. Cinemaware allocated enough space on the two disk set to allow for digitized responses from the Barnstorffs which can be either good or bad. If the player picks the wrong things to say back to the Barnstorffs, then Otto produces a gun and throws the player out of the gondola. If the player picks the right responses then he is allowed to pilot the Zeppelin back to the U.S.A.

After this encounter, the player returns to the main menu. This menu has background picture that is supposed to represent Rocket Ranger's home base, Fort Dix. The player has a choice of four different areas he can choose: the war room, fuel depot, rocket assembly and takeoff. In the war room the player is greeted with a world map. This map is divided into the various countries that can be taken over by the Nazis. The Nazi war machine is represented by a fleet of Zeppelins that move into various countries

randomly. In addition, the rate of Nazi efficiency is listed in the upper right hand corner of this scene. The efficiency can be raised or lowered depending on the actions of the player.

On this map the player has control of five secret agents. The player, by using the joystick, can place these agents in various countries. The agent's job is to infiltrate the country and find out if there is a secret rocket base, lunarium depot or other essential targets Rocket Ranger can destroy. After the agent has infiltrated the country the player can choose to move the agent out of the country or change his orders so that he builds resistance to the Nazi takeover in the country. If he is successful the Nazis, upon entering the country, will have to fight the resistance before moving on, creating extra time for the player to complete the

**Hitler and his Nazi war machine are receiving help, not from Italy, but from Aliens based on the moon. These Aliens mine Lunarium which the Nazis turn into Lunarium bombs.**

ultimate mission of the game. Unfortunately, secret agents can be discovered by the Nazis. If they are discovered, they will be put to death. This slows down the player's ability to complete the mission.

After the agents find where the secret bases are, it is Rocket Ranger's job to seek out and destroy the bases, while gaining valuable parts for the space rocket that must be built.

There are three main missions that Rocket Ranger can go on. The first mission is to get rocket parts. After using the secret decoder wheel, this games write protection, to select the right amount of Lunarium to put in the rocket pack, the player must go through the takeoff procedure. This basically involves the timing abilities of the player, for he must synchronize his joystick movements with the movements of Rocket Ranger. This can become hard because the more fuel stored in the rocket pack, the more movements the player must make before he is allowed to take off. If the player does well then Rocket Ranger takes off in a well directed video scene. If the player does poorly, the Rocket Ranger falls on his face.

If the player is able to take off then he hopes he "flies" to the country he chose. The reason why I said he hopes he makes it to the country is because if the player puts the wrong amount of rocket fuel in the pack, he may fly to the wrong country. Or, in the worst case scenario, ends up falling out of the sky because there wasn't enough fuel to get anywhere. In this case the game ends abruptly.

Finally, if the player makes it to the rocket factory, he must find and retrieve the needed rocket parts. This is no easy task since an armed guard stands ready to defend the rocket base. Fortunately, for Rocket Ranger, the Nazi, like most of the other Nazis, does the stupid thing by dropping his weapon and deciding to fight Rocket Ranger hand to hand. An exciting battle follows; if Rocket Ranger is successful then he gets a needed rocket part. If he fails, he is captured and later escapes, waiting valuable time.

**The game has many nice extras, including fades from color to black and white when a mission is completed and four channel stereo sound...**



Up up and away...

Excellent graphics, superior sound and fantastic game play make *Rocket Ranger* one of the better software packages available.

The next type of mission involves raiding the Nazi's Lunarium fuel depots. There are two depots, one located in an ancient temple and one at the Nazi rocket base. The depot at the temple is guarded by a battery of eight machine guns which must be knocked out before gaining access to the Lunarium stores. The rocket base is heavily guarded by a seemingly endless compliment of anti-aircraft guns, if all of the anti-aircraft stations are destroyed, then Rocket Ranger is allowed to reap the benefits created.

The final type of mission Rocket Ranger can go on is an air raid. Occasionally, the spies Rocket Ranger places on the world map find an ammunition dump or Nazi brainwashing camp. Rocket Ranger can fly into these countries and try to destroy the bases. The Nazis do not take this lightly, because they send up a squadron of ME-109s to try and knock you out of the sky. Defeat all of the fighters and the air raid will be complete. This is not as easy as it sounds, because the fighters are by far, the toughest mission that Rocket Ranger can go

on. It also reaps the greatest reward, because each successful raid lowers Nazi efficiency by at least ten percent, which, in turn, means that there will be more time to complete the mission.

If Rocket Ranger can survive long enough to get all the rocket parts and fuel, then he will be able to go to the moon and put down the Nazi regime once and for all.

Considering how the game plays, this is by far one of the most entertaining games I have ever played, and one of the hardest. Cinemaware pulled out all of the stops when it came to creating this game. The game has many nice extras, including fades from color to black and white when a mission is completed, four channel stereo sound that causes my neighbors to pound on the walls due to the heavy bass in some of the musical scores. Even digitized voices for all of the characters in this extravaganza. But most of all, this game has playability and toughness. This isn't one of those games where you can win it once and then know how to do it from then on in. Each game is uniquely different depending on what the player does.

To conclude: Cinemaware has done a bang up job with the release of *Rocket Ranger*. This game was reviewed on an Amiga 500 with one megabyte of RAM. *Rocket Ranger* is available for other systems as well.

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See your local Commodore-Amiga dealer for terms and further details.

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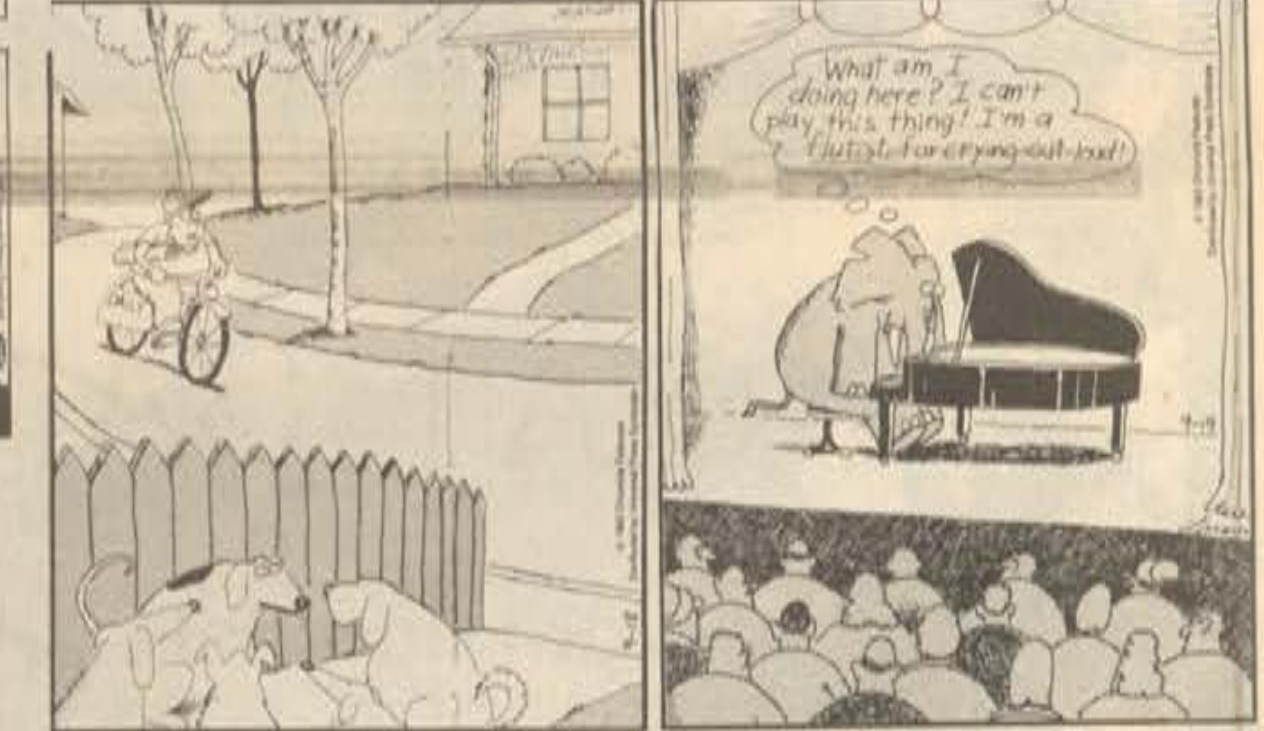


Suddenly, Professor Liebowitz realizes he has come to the seminar without his duck.

"That time was just too close, George! Jimmy was headed straight for the snake pit when I grabbed him!"



Early vegetarians returning from the kill.



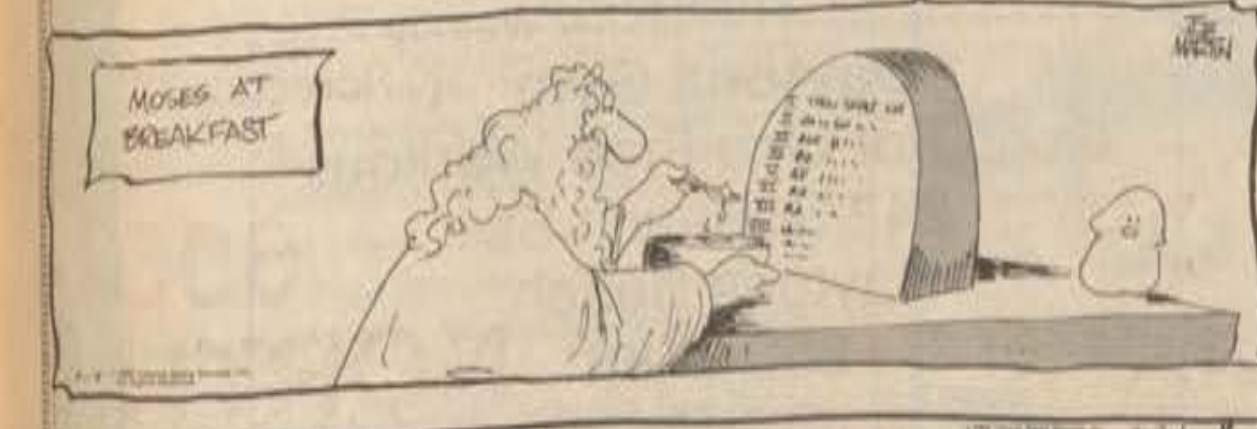
"OK, this time Rex and Zeke will be the wolves. Fill and Muffin will be the coyotes, and... Listen!... Here comes the deer!"

The elephant's nightmare



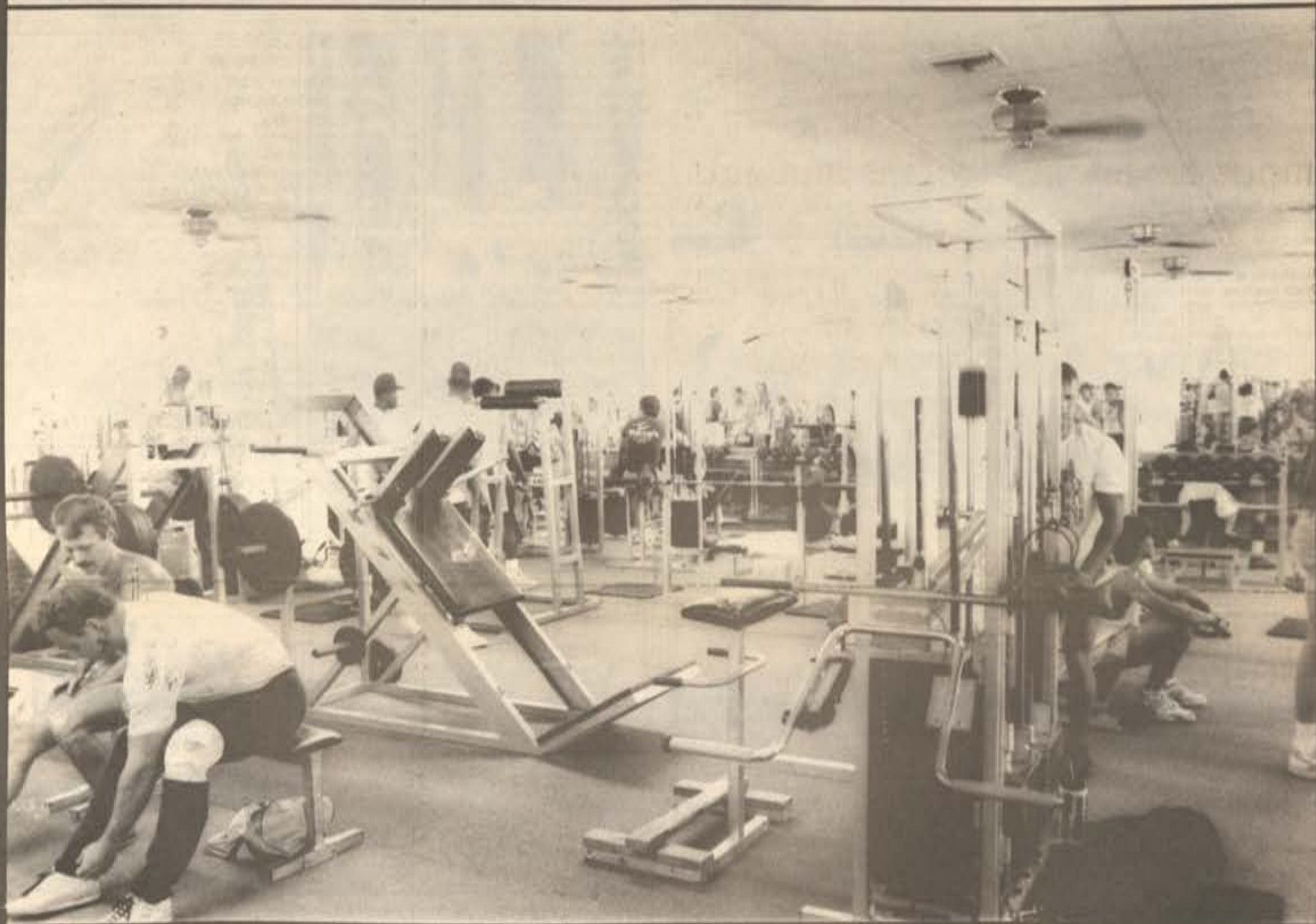
Mister Boffo by Joe Martin

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# Changes in flight explained

Despite all the communications (both written and verbal) regarding the new curriculum, there still seems to be considerable confusion, particularly regarding the new flight courses. Indicated below are some of the questions (and answers) most frequently asked to date.

1) How will the new curriculum affect me if I wish to remain under my original catalog?  
**ANSWER:** The policy regarding catalog applicability has not changed. Students may stay in their original catalog or change to the current catalog any time they wish. (Remember: once you change catalogs you can not change back.)

2) If I stay in my current catalog, will I have to take more credit hours than my catalog specifies in order to complete the Aero Science Program? **ANSWER:** No one will be required to take more credits than their catalog requires. Substitutions will be made where necessary, but the credit hours will never exceed the requirements of the applicable catalog.

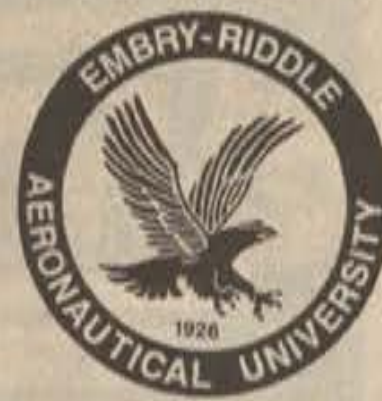
3) If I have already taken AS150, AS180, and the other existing academic courses, how can I receive credit for them once the new catalog is implemented and these courses are no longer offered? **ANSWER:** If a student compares the two catalogs, they will find that the requirements to obtain their FAA certificates (Commercial/Instrument/Multi-Engine) under the new catalog consists of eleven less credits than currently required.

The old academic courses may be used to fill these credits. If the number of credits exceed eleven, additional credits can be applied to open electives.

**Please see your advisor before making any decisions**

In case you haven't completed all of the old courses before the transition, they won't be required to complete your degree.

If this transition turns out to have given you less credit hours than your current catalog requires, these credits may be made up in any AS/FA/SF elective. Please see your advisor before making any decisions.



# Seniors plan for party

The first meeting for all December graduates will be held in the Student Center on Tuesday, October 9, 1990, at 8:00 p.m. Important graduation information will be reviewed and elections for Senior class President and Vice President will be held.

If you are interested in running for Senior class President or Vice President, please schedule a meeting in the Student Activities office with Laurie

Raffox, on the Senior Class Council, who work together to plan the Senior Class Party, raise funds for this event, secure discount hotels for your guests at graduation, etc. This group will be selected immediately following the meeting on October 9, 1990.

If you are unable to make the meeting, but would like to be on the council, please sign up in Student Activities.

# Students look to Homecoming

**Sub-Committee Members Needed**

There's a spirit in the air, it whispers that fall weather may come to Florida before the end of October, and anticipation can begin for the many activities associated with Embry-Riddle's Homecoming Activities.

This year's theme is "Homecoming '90 - Any Questions?". We will have lots of questions answered for you as time goes by. But the Homecoming '90's first question is: "Would you be interested in being a student volunteer on one of the many Homecoming sub-committees? The second question is: "Would you be interested in taking the

responsibility of Student-at-large on this year's Steering Committee?" If you would like to work on Publicity/Spirit, Activities, Athletics/Recreation, Entertainment or the Steering Committee, please come by the Student Activities office before Friday, Sept. 21 and sign-up.

And, get into your school's spirit. Embry-Riddle's school colors are Blue and Gold, the school's mascot is ERAU, the Eagle, so be thinking of a special outfit or costume you can wear on Friday, Nov. 9 in support of Spirit Day! Get in the spirit of Homecoming '90 and sign-up for a sub-committee position, today! "Any Questions?"

# Wright Flyer video offered

Embry-Riddle students and faculty have an opportunity to buy Paul Garber's series about the Wright Brothers' First Flights at a special price.

In this series there is original footage taken from both the ground and the "cockpit." In addition, this series provides a biography and a history of the Wright brothers and the Wright Flyer.

The video tape series is 145

minutes ( 2 hours and 25 minutes) long and worth every cent of the price charged by the Smithsonian Institute. Moreover, this offer is made as a non-profit activity initiated by an ERAU student.

The cost for this series depends on the response to this letter.

For example: 102 copies ordered-\$25.00 per copy, 203 orders-\$20.00 per copy, 304 orders-\$18.00 per copy.

The more copies we can order as a

group, the cheaper the per unit cost.

If you are interested, please send your name, box number (or address), or some way to contact you in the event enough people want to own a copy of this unique series. My ERAU address is Box 6752.

If enough people are interested, I will then ask for your money to buy the series from the Smithsonian Institute. Don't let this opportunity get past you!

# Campus Ministry welcomes students

The office of Campus Ministry welcomes all new and returning students. The office is located in Residence Hall 2, in room 277. All faiths, as well as particular Christian denominations, can get information about religious services off-campus by consulting the office at extension 6880. Office hours are Monday through Friday 1pm to

10pm. The prayer reading room is open during office hours. University chaplains are Kenan Morris, O.P.M. and John P. Wheeler.

Religious services on campus will be held as follows: Catholic Mass - on Sundays at 10am, 7pm, and 10pm in the Spruance Hall Atrium and on weekdays at 10pm.

# FAA schedules exams for semester

ERAU will administer FAA written exams for the following:

- Private Pilot - Airplane, Commercial Pilot - Airplane, Flight Instructor - Airplane, Fundamentals of Instruction, Ground Instructor - Basic, Ground Instructor - Advanced, Airline Transport Pilot (ATP121) - Airplane, Aircraft Dispatcher, Airline Transport Pilot (ATA135) - Airplane, Instrument Rating - Airplane, Flight Instructor - Instrument - Airplane, Ground Instructor - Instrument, Flight Engineer - Basic, and Flight Engineer - Turbojet - 727.

They will be administered on Saturday, September 29 at 0830 and 1400

**Explanation of appropriate forms and procedures will be given. Immediately thereafter.**

in G-104, GRW Complex.

Students intending to take the FAA Pilot Written Examinations are required to sign up in Office H-119 or call extension 6830 prior to examination day.

At the time of the examination, each student must present a receipt for pilot exam fee, validated by the

Cashier's Office; a written authorization form signed by an appropriate Aeronautical Science Department Ground Instructor, or the failed results of a previous FAA written examination, and present as personal identification an Airman Certificate, driver's license, or other official document.

Explanation of appropriate forms and procedures will be given. Immediately thereafter, testing will commence and unless prior arrangements have been made, late examinees will not be permitted to enter the examining area while testing is in progress.



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SUBARU XT Turbo 4WD, '87, black, power everything, sun/fin, cassette, new dash \$8,500. Call 255-4767 and ask for Ramiro.

1988 CHEVROLET Spectrum, clean, excellent condition, air, automatic transmission, tint windows, reliable transportation, all original parts. Need to sell for \$3,795. Call Mike at 760-6615 after 5 pm.

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YAMAHA FJ 1100, 1985, showroom condition/garage kept \$2600.00, 9000 miles - 2 helmets. Steve 756-7915.

### Miscellaneous

Need of IBM Prices for computers? Custom solutions for low prices. Goldstar 286/ VGA/ 32MB/ 30 Meg Drive/ 1024K \$1299. 386/ 64MB/ 40MB/ 40 Meg Drive/ 4096K \$1699. Infinite diversity in infinite combinations. LV Message at 238-7355.

WIZARD BUSINESS COMPUTER FOR SALE! As reviewed in last weeks Avion, comes with 32K RAM and 8 language translator data card. Like new, in original box with all manuals. Comparable cost when purchased of over \$300. Will sacrifice package at \$230 firm. Contact Jason, 239-5973, for more information.

ALPHA WIND SURFER AND HARNESS. MUST SEE \$350 o.b.o. call Jack 255-1738 best if after 5:00 pm.

ALPINE car stereo, model 7282, 2 months old. AM/FM case, auto reverse SCC Head. 32w. box style faceplate. \$150 o.b.o. call Mark 257-3149.

3.5" disks \$1.25 each, 5 or more \$1.00 each. Contact Brian box 8013 or 258-1459.

9MM EXCAM TA90, new condition call 257-4321, ask for Dave or Dean.

IBM PC/XT comp, 640K Ram, 2 3.5" floppy drives, 101 keyboard, Hercules graphic adapter, 10 MHz, also software, sell for \$599, for additional info. call Mike at 760-6615 after 5 PM.

FOR SALE Only 8.5 miles from campus! 12' x 60' Mobile Home, 2 bedrooms, central heat/air, low lot mat (\$157.00 per month), large lot: 50 x 100', washing machine included, storage shed, covered patio, small pet and children welcome. Park amenities include tennis courts, swimming pool, children's playground. On bus line. Close to shopping. OWNER ANXIOUS TO SELL! Call Laurie: Days, Mon-Fri ext. 6039, evenings, 767-9834. Only \$12,500.

ITEMS FOR SALE: white and gold ornate 3 way lamp with clock, \$15; lg. seascape picture, \$5; single foam mattress, \$10; straight chair (good at desk), \$10; lg. still life oil painting, \$20; small still life oil painting, \$15; Misc. household items (glasses, etc.) Call Harriet, 239-6901 between 8-5.

C64 Add-on: graphics pad with software \$15.00 modern with terminal program that displays 40-80-100 columns on a stock C64. \$20.00 call 760-3219 or leave message in Box 4412.

FOR SALE: TI-74 with extra Ram cartridge and mathematics cartridge all for just \$80.00 (paid \$150.00) call 760-3219 or leave message Box 4412.

FOR SALE: Living room furniture set. Great condition, couch, loveseat and chair. Tan with blue and grey design. \$200 or best offer 767-2361 Please leave message.

BIKE PARTS FOR SALE-Component series off a mid-grade Schwinn Bicycle. Brake callipers, cranks, front fork, rear wheel, tires, tubes, handle bar stem, etc. Repair your sick bike or upgrade your K-Mart "special"! Will sell package or separate. Will install-call Neal at 256-8406.

FOR SALE-Weight 550. Bosch Cruiser \$45, 12 speed bike \$75, contact Matt at 255-3057 or Box 6767.

FOR SALE: Four channel model aircraft with true Futaba six channel radio. Only been flown a couple of hours, re-enforced nose, has never been crashed or abused. Six channel Futaba comes with six Futaba servos that have never been used or placed in an aircraft. I am no longer interested in the sport and need the money. Excellent for the starter who wishes to upgrade in the future! Asking \$560 neg. Call Jason 239-5973. The sky can be yours!

FOR SALE - Canon CP-5, 35mm camera with power winder, 80-200 zoom lens, 50 mm lens, and bag \$225.00 call 274-2645

BOOK FOR SALE-ES 305 Thermodynamics \$50, write to Box 6637 if interested.

DORM SIZED "cube-fridge" \$30 call Mike at 254-4935, or drop note in Box 2293.

JET SKI CLUB: people who are interested in renting, riding and working on Jet Skis please contact Tim 3221.

NEEDED: Students interested in joining the Phoenix Staff. (its a yearbook) contact Christine LoMonte Phoenix Editor.

FOR SALE: Raleigh Grand Prix 10 Speed. Senior components. Leather Saddle. Excellent Condition. \$50.00 Contact Professor Vashury at X-6765 or Call 767-7305.

LOST: Black baseball cap with P-16 printed on it. If you have it please turn it in to lost and found (information in U.C.)

TUTOR NEEDED: PS 104 must be qualified 760-1688, Box 7148.

PRIVATE TUTORING: need help in math, physics or chemistry I can help. I am a senior All student. Call Kenny at 760-0241 or drop a note in Box 1156.

MAZDA RX-7 owners: Need work done to your car? Quality work reasonable prices. Call Steve at 253-9617 Please leave message.

CUSTOM RACQUET Stringing \$10.00, Box 3343, Down 2 rd 202 238-4074. Please leave old strings in the racket.

GERMAN CAR REPAIR: Rob Warlick thanks all you German car owners for your business. For Quality work in VW - Audio contact Shorby at 673-0801.

FOR SALE: CX-1 flight computer \$35.00. Call Will at 239-8640.

1985 SUPRA BEAST SKI BOAT 198" 458 cu. in. engine, on board cooler, full cover and trailer with surge brakes. Must sell soon. Price nego. Call Will at 239-8640.

DISK for sale \$25.00. Call 760-1754.

GUITARIST, please buy my "Rockman" soloist audio processing unit. Clean, distorted, reverb. Boosts small amp or play with head phones. I have a 100 Watt I don't need the rockman now. Original box \$75.00 call Neal 254-8406.

MOVING - Must sell: Weight System (new) \$150, King size bed \$75, dresser \$20. Call Pete 760-7063.

DAVID CLARK H10-80 headsets for sale used under 10 hours. Best offer accepted. Call Geoff at 257-1764.

NEED HELP IN ACCOUNTING? Let me help. Call Nat at 255-3057 for rates and more information.

ANDREWS CALLIGRAPHY SERVICE I can do certificates, invitations, poems, anything you need. Professional quality at very reasonable prices. Call Andy at 253-2479 or leave message.

### Roommates

ROOMMATES NEEDED: 4 bedroom, 1 1/2 bath, house in South Daytona, needs 3 more people. Quiet neighborhood, furnished house. \$200/mo and 1/4 utilities. Call Kim at 756-8560

One bedroom apartment with covered parking. Walk to beach or Seaside area. \$255/mo. \$250 security. Female/male welcome. Interested parties contact Chris Box 5835. Immediate occupancy.

WANTED: 2 ROOMMATES to share 3 bedroom house. \$255/month. Includes utilities, washer, and dryer. Contact Jeff 239-0827.

ROOMMATE wanted to share 2 bedroom apt. 2 mi. from school \$205/mo and 1/2 util., phone. AAC, dishwasher, pool, tennis, security guard, call Andre anytime 253-0808.

ROOMMATES WANTED: Private lake front house 2 1/2 miles from school. Two rooms, Florida room with private entrance. \$190 a month, other room \$210. Shared utilities, central A/C, washer/dryer, big garage (for bikes only), male/female. Please call between 7:30-11:30 am, weekdays at

HOUSE FOR RENT, 2 bedrooms, 2 bath, 2 car garage, fully furnished, 3 miles from school \$600 a month. Call Mike at 756-4637.

ROOMMATE WANTED-2 bed room apt. \$192.50/mo, plus 1/2 utilities, only 2 miles from campus, non-smokers, please contact Matt at 255-3057 or Box 6767.

ROOMMATES WANTED: couple, best students, looking for quiet person or couple to share a house with us starting Oct. 15 can help choose house, single person 1/3 expenses, couple 1/2 expenses. If interested please call 253-9268, ask for Chris or leave message.

### Personals

LIGHT BULB JOKES #1 How many bureaucrats does it take to change a light bulb? Four. One to screw it in and three to write the environment impact statement.

BABYDOLL, I hope you had a Happy Birthday. Don't forget to stop at the liquor store on the way home. I love you. LOVEBUNNY

HOW MANY OREGONIANS does it take to screw in a light bulb? Three. One to screw it in and two to fend off all those Californians trying to share the experience.

JOSE Becky wants your warts. AV

AVION STAFF. Why are you guys so weird? PHOENIX STAFF

BRIAN, KRESS, AND JOE Hope to see you all in D.C. Maybe this time we can go to bars legally now that I'm almost 21 (and will be when we get there). BINO

JOHN (1/2 dynamic duo), I'm sorry we never got together to study Thermo, maybe we can somehow study materials. CHRIS

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