NASA
Lyndon B. Johnson Space Center

Space News Roundup

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Artist Hugh Laidman sketched these views of JSC employees at work recently for the NASA Arts Program.

Message to Employees

The year 1980 was a time of great challenge for Johnson Space Center employees. Years of research and design came to a turning point this year as all orbiter systems were completed and made ready for the first Space Transportation System mission.

Then in July, a firm launch date was set for March 1981, and our design and testing work took on a new momentum. All schedules were set for the March launch date. We faced new deadlines, and those deadlines were met.

In July, the target was set for rollout at the Cape from the processing facility to the Vehicle Assembly Building in late November. We met that target within 72 hours—a culmination of teamwork and efforts between employees at NASA centers all over the country.

Now the pre-launch momentum has set in all over this center as flight controllers work out the last details of procedures, payload engineers prepare their equipment, technicians make final adjustments, and the STS-1 crew performs final training exercises. In the next month, we will be engaged in mission simulations integrated with the orbiter at the Cape. We will be watching with intense interest as the orbiter completes its final pre-launch checkout. And finally, in March, we will see the product of years of work—the first Space Shuttle mission.

All of our work schedules are now tightly packed, but I would like to take some time to wish all JSC employees and contractors a happy new year. Take a moment to reflect on this significant period of time—when the years of planning and dreams have come to a zenith and the first mission approaches.

The work of each employee is part of the overall effort—space projects are not the work of individuals alone, but the combined effort of thousands working together.

This year, NASA will once again be flying man in space and you made it possible.

Happy new year to all of you.

Christopher C. Kraft, Jr.
Director, Johnson Space Center

Columbia poised for launch

Columbia rolled towards readiness this week moving to Launch Pad 39 at the Cape to begin final preparations for launch.

All scheduled work was completed the month the orbiter spent in the Vehicle Assembly Building, and after a short holiday break, NASA workers and the public, numbering in the thousands, stood by for the seven and a half hour crawl across Kennedy Space Center grounds to the historic launch pad where man left Earth for the Moon.

The orbiter rolled out at 8 a.m. EST December 29 and reached the top of the launch pad at 3:30 p.m. This rollout came only three days after the date scheduled last July.

Speaking at a rollout ceremony, STS-1 Commander John Young spoke of what a great day it was for the United States, "although there's only one problem—America doesn't realize it."

At the same ceremony, STS-1 Pilot Bob Crippen swept aside schedule problems so often overplayed by the public by saying, "I'd like them to look behind me at this technological marvel."

The Columbia is now poised upright on its oceanside launch pad, with some jobs left to be done—among them completion of the gap filler between some tiles, final connections, a pad validation test, and countdown and mission demonstration.

A final determinator of the March 14 launch date—the current working or target launch date—will be the Flight Readiness Firing in early February where the orbiter's three main engines will be fired for 20 seconds with all connections, wiring, and software operating.

After a successful FRF, all systems are go.

The last weeks of December, the prime and backup crews, Joe Engle and Dick Truly, carried out complicated interface tests to check out mechanical and electrical connections.

NASA foam resists fire

A spongy, light-weight material that resists ignition better than any materials now in use, and upon ignition at 426 degrees Celsius (800 degrees Fahrenheit), only chars and decomposes, has been developed for JSC by the Solar Division of International Harvester, San Diego.

The new flame-resistant material, named "polyimide resilient foam," could further reduce in-flight fire risks and lengthen the time allowed for airline passenger evacuation from two to five minutes for a survivable crash complicated by an external fuel fire.

Accident statistics given the U.S. House of Representatives, 96th Congress, in 1979 revealed that from 1965 through 1978 fires occurred in about 20% of all air carrier accidents involving passengers.

During this period there were 2,727 fatalities, 469 or 17% attributed to the effects of fire or smoke. The data were presented in hearings before the Subcommittee on Oversight and Review of the Committee on Public Works and Transportation.

Once in production, polyimide foam also could provide extra safety for surface transportation including school buses, trains, and automobiles, NASA fire experts said.

Polyimide foam is being suggested as a replacement for polyurethane used in aircraft seat cushions, which represent the largest amount of flammable material in airline interiors. Since the new polyimide does not outgas until it begins to char at the approximate 800 degree F temperature, it is also safer from toxic fumes produced by polyurethane at ignition.

See FOAM, Page 2

After 15 minutes of flame at 1800° F (insert), only a small area was charred

Under growing workload Ops secretary excels

Nina M. Maxey has an unusually strong sense of commitment to her job. She is self-motivated and able to perform tasks with little or no direction.

Maxey was recently named Outstanding Secretary for November 1980. She is Secretary to the Deputy Manager in the Space Transportation System Operations Office.

With Space Shuttle operational flights growing nearer, the workload in STS Operations grows heavier, with a growing number of technical briefings and presentations. Maxey has become so proficient in assembling charts and background material that she has become an invaluable assistant to the Deputy Manager.

She willingly works overtime when time is critical, and she is able to organize her own time as well as advise the Deputy Manager in scheduling meetings and action items.

And through it all, she remains cheerful. Even though she is usually under deadline pressure, she maintains a positive, stable, and cooperative attitude.

Maxey is an outstanding secretary and an asset to the center, and she is well deserving of the Outstanding Secretary honor.

Nina M. Maxey
Outstanding Secretary

Piland retires from COD, Gilbreath is new director

Joseph V. Piland retired and left his post as Director of Center Operations last week. He will be replaced by his former deputy director Kenneth B. Gilbreath.

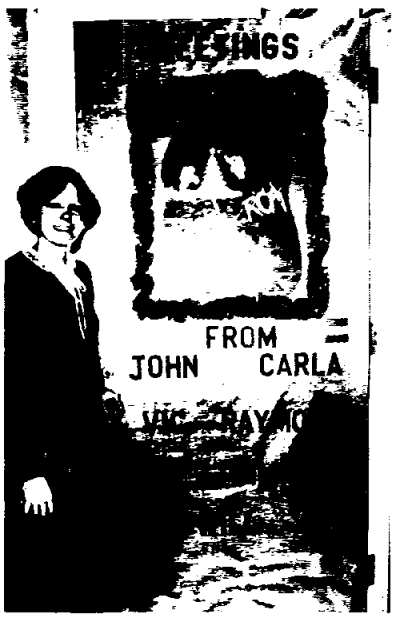
Piland began his career in the space program in 1962 when he was assistant to the Manager of Project Mercury here at JSC. He served as Program Manager of the Lunar Receiving Laboratory, as Manager of Technical and Engineering Services, and as Deputy Director of Administration.

The Director of Center Operations is responsible for the facilities and services which operate the center, an area which includes design and construction, property management, and maintenance and engineering.

In addition, Piland directed the management of such diverse activities as publications, graphic services, printing, personnel and physical security, office services, and transportation.

Piland has served as Director of Center Operations since 1971.

Gilbreath began his post at JSC in 1972 after having served as Manager of the White Sands Test Facility.



Employees in Building 44 held a holiday door-decorating contest last month. Pictured here are the four winners: at left, left to right, are Pat Peugh, Lynne Salinas, and Rosemarie Haynes of Lockheed; below, left to right are Carla Stinson of RCA; Miriam Gonzales and Bill Shannahan of Lockheed; and Beverly Bendgen of Boeing. They all enjoyed eating their prizes, and so did the judges.

'Twas night before liftoff

The following poem was found on Roundup's doorstep the day after Christmas.

Twas the night before liftoff
And all through the Cape
The technicians anticipate
The Orbiter's escape.

The astronauts were nestled
All snug in their beds
While visions of Buck Rogers
Danced in their heads.

The Shuttle and boosters
Were made ready for Flight
By personnel who labored
All through the night.

When out on the pad
There arose such a clatter
That the security guards ran
To see what was the matter.

And to their wondering eyes
Did appear
A miniature sleigh
With eight tired reindeer.

The guards heard from above
As they watched the odd sight
"My reindeer are pooped,
I'll need the Shuttle tonight."

So he opened the hatch
And threw in his red sack
And said, "Watch my deer
Until I get back!"

With a "ho ho ho"
And a Merry Christmas to all
He fired the rockets;
The guards ran for the wall.

He opened the bays
To distribute the toys
And he stopped at the homes
Of good girls and boys.

Barrios provided
The detailed flight plan.
For a night's hard work
By a jolly old man.

By Training Class II, Barrios Technology, Inc. (Sandra Linton, Charles Ekner, Melva Bennett, Arnolia McDowell, Steve Ryan, Danny White, and Sue Lyons.)

Sketch by Chip Sturman

Foam resists fire . . . . . .

From Page One

As part of a cooperative NASA/Federal Aviation Administration program to enhance occupant safety in postcrash fires, four polyimide double seats will be supplied for test and evaluation by the Federal Aviation Administration in a C-133 aircraft at the FAA's Technical Center in Atlantic City, N.J. The C-133 is a surplus military cargo aircraft modified to resemble typical large jet transports. The test aircraft will be subjected to a test fire representative of postcrash fires.

The foam is not only safer, say NASA fire safety experts, but also provides an estimated 50% weight savings, thereby improving aircraft energy efficiency.

By varying the ingredients of polyimide, the material hardens and can be used as light-weight wallboard or high-strength rigid floor panels while retaining its fire resistance. As a thermal-acoustical insulation with polyimide foam, wallboard could act as thermal or fire barriers, reducing the cabin interior heat load and preventing other flammable materials from igniting.

Manufacturers of commercial aircraft and airline companies have sought improved fire-resistant materials since the early 1960s. By the late 1960s NASA had developed some fire-resistant materials for the Apollo spacecraft and Skylab vehicle.

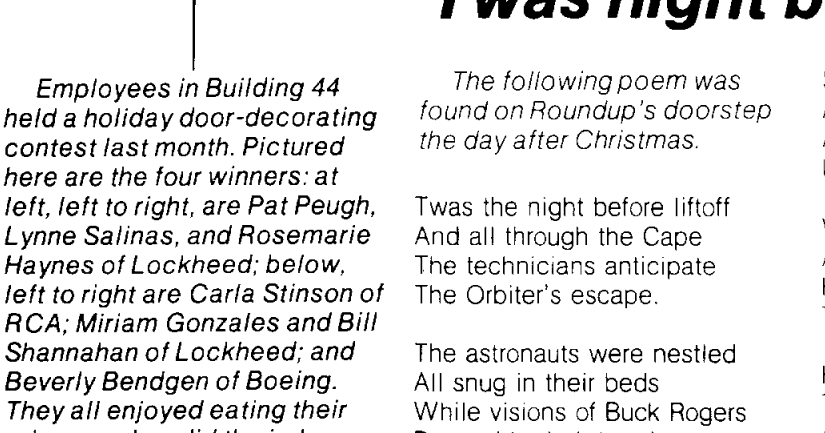
The Technology Utilization Office at NASA Headquarters in Washington recommended these materials be made available to the public, particularly the aircraft industry, which chose not to adopt them because the materials lacked durability, were not commercially available, and cost too much to produce. Further efforts resulted in development of polyimide resilient foam, produced for NASA by the Solar Division of International Harvester. Limited production is to begin next year.

The Cafeteria menu will not be run until a future date due to extensive contruction now taking place.

"Technology is the only thing that this Government can invest in that is deflationary, inherently deflationary. It creates new goods and services."

--Harrison Schmitt

Divisions that play together . . .



June of 1980 the NASA Exchange approved funds for each JSC organization to hold an EAA-sponsored event. Picnics and parties sprang up around the center. At top, the Program Operations Office held a tug-of-war among other events at their October 8 Oktoberfest. At bottom, Photo Technology Division employees romped at their October 25 picnic.

Schmitt addresses employees

With first Shuttle flight comes a new chance to say, 'Let's go'

The future looks good for the space program under the new administration, said Senator and Apollo 17 Astronaut Harrison Schmitt in a speech to JSC employees December 17.

Transition teams at work in Washington today are strong on science and technology and show a positive general feeling towards both civilian and defense related space activities, he said.

"I can't emphasize how important this first flight of the Shuttle has become," he said. "It could be the catalyst by which we really start to move again with purpose in the nation's space program."

Schmitt said that recent planetary successes have generated interest "at just the right time."

"They demonstrated what NASA can do at the far reaches of space, and what they can do when given a task and the resources to accomplish that task."

Now with the first flight of the Shuttle, the new administration will have the opportunity to say, "Let's go," he said.

Schmitt said there is increasing interest among non-defense personnel as well as defense personnel in the implications of the Soviet presence in space and the potential use of that environment, "not only as we use it today in

Sen. Harrison Schmitt

reconnaissance and communications, but also in the development of new strategic policy."

He said new technology, particularly in aeronautics, can make American policy more humanistic—that America can use space technology "to develop weapon systems which are designed to defend rather than to annihilate."

"There are some who have been advising an economic shock treatment to the economy that would lump NASA activities in with those that are nonessential," an idea which he said "stretches the imagination."

Policy teams in the new administration are emphasizing space related activities, "actively soliciting ideas" on the accelerated use of space technologies, particularly in applications and information systems and the role they can play in the conduct of foreign policy.

"We have underestimated the Congressional attitude," Schmitt said, adding that Congress traditionally follows the lead set by the administration concerning high technology matters.

He later said he perceives the new administration to be "bullish" about space. "However, if there is one area of perceived difficulty within NASA, it is in its ability to make accurate forecasts of the cost of new and old programs and to anticipate changes in those costs."

Schmitt compared the new frontier or new environment of space with the Earth's oceans centuries ago. "If the British had not seen fit to dominate the oceans to protect the seed of freedom they had planted, the course of human history would have been very different," he said.

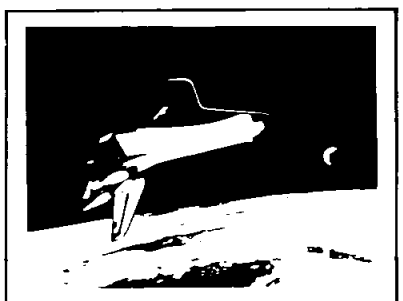
"We now have a new ocean in which that same competitive urge of mankind exists.

"Your role in this battle is clearly at the front line. It's not a shooting battle; it is, however, a battle of 'being there'—being there in near-Earth orbit with the Shuttle, being there before the end of this century with a large and active American station in space, and being back on the Moon or on Mars in the next decade.

"Among the people on Earth today, probably among your own families, we have the parents of the first Martians. There are no technological barriers between mankind and settlements on Mars or on the Moon. There are other types of barriers, but no technological barriers.

"Some of those children playing around the Christmas tree this year will have the option in 20 to 30 years to decide whether or not to go live permanently on another planetary body.

"I think we have to give them that option."



The *Roundup* is an official publication of the National Aeronautics and Space Administration, Lyndon B. Johnson Space Center, Houston, Texas, and is published every other Friday by the Public Affairs Office for all space center employees.

Editor..... Kay Ebeling

Playin' at the Rec Center

The Gilruth Recreation Facility is offering the following leisure time classes for your winter enjoyment. Registration is now being accepted at Bldg. 207.

Beginning Tennis - a course designed strictly for persons with no previous formal instruction. Class meets from 5:15-6:45 p.m., Tuesdays, beginning January 20 for eight weeks. Cost is $24 per person.

Intermediate Tennis - for persons who want to work on a special difficulty in their tennis game. Class meets from 5:15-6:45 p.m. on Thursdays, beginning January 22. Cost for this eight weeks course is $24.

Ballroom Dance - an opportunity to learn all of the popular social dances from waltz to disco to the samba. Classes begin on Wednesday, January 21 and meet for one and a half hours for ten weeks. Dancers are categorized as beginners, intermediate, high intermediate, and advanced. Cost is $50 per couple and registration deadline is January 14, 1981.

Country and Western Dance - features the latest in C&W steps as well as the old standbys. Class meets on Mondays at 7:15 p.m. for beginners and 8:35 p.m. for advanced. Cost for the six week course is $18 per couple.

Women's Exercise Class - a chance to firm up and shape up for the New Year. Class meets Tuesdays and Thursdays from 5:15 to 6:15 p.m. Cost is $12 per month.

Hatha Yoga - learn the art of stress reduction; release from tension and fatigue; muscle tone and weight reduction. Class meets from 5:15-6:45 p.m. for six weeks beginning Tuesday January 13. Cost is $20 per person.

Saturday at the Movies - The first children's movie for 1981 will be the Disney blockbuster "The Black Hole." Movie time is 10 a.m. on Saturday January 17. Cost is $1 which includes popcorn, coke, and cartoons.

Speechcraft starts 14th

A Speechcraft program will be offered by the JSC Toastmasters Club beginning January 14, Jim Hiott, club president has announced.

Speechcraft is open to anyone over 18 years of age; however, enrollment is limited and participants should enroll early. Cost is $15 which includes all textbooks and materials.

The eight sessions of Speechcraft will be held during the regular JSC Toastmasters meeting each Wednesday at 6:30 p.m. at Franco's on NASA Road One.

For more information and enrollment, contact Dr. Charles Bourland at x3881 or Jim Hiott at 488-5660 x346.

Retired employees meet

Chapter 1321 of The National Association of Retired Federal Employees will meet on Wednesday, January 7, at 1 pm, in the Clear Lake Park Building, NASA Road One. Visitors are welcome.

Jack M. Simpson, Jr., President of the Texas Federation of NARFE Chapters, installed the NASA-Houston Chapter 1321 officers for 1981 on December 5. Incoming officers are: President, Shell Martin; First Vice President, Mary Olsen; Second Vice President, Burney Goodwin; Secretary, Hilda Grimwood; and Treasurer, Mary Kotanchik.

For additional information, call Shell Martin - 471-0490 and Mary Olsen - 334-3270.

Roundup Swap Shop

Ads must be under 20 words total per person, double spaced, and typed or printed. Deadline for submitting or cancelling ads is 5 p.m. the first Wednesday after publication. Send ads to AP3 *Roundup*, or deliver them to the Newsroom, Building 2 annex. No phone-in ads will be taken. Swap Shop is open to JSC federal and on-site contractor employees for non-commercial personal ads.

Cars and Trucks

For sale: '71 VW Convertible 43,000 miles, canary yellow and black. $2,750.00. X6158.

'78 Camaro pwr. brakes/steering, automatic, air, FM radio, both engine & body excellent cond; 24,000 miles. Best offer over $4500. Peacock x2208.

'67 Chrysler Newport 4-dr, auto, a/c, dependable good running transportation, low miles, $200. X4623.

'72 Dodge 4x4 w 11-1/2 Tejas cabover, duals, loaded, sleeps 4, good cond. $5000 for all. Andy x5127, 488-5344.

'78 Chevrolet Beauville van (350 engine) 55,000 miles extras. Ziebart treated. Good condition, $5900. Call 488-3377 after 5.

Pick-up truck fiberglass cover, $300. Whitmah 481-2854

1973 Vega Hatchback, 4-speed, AC, low mileage, good condition $450. 488-2318.

'75 Mustang Ghia. 302-V8. auto, air, pb., ps., vinyl top. Exc. condition, $2600. Ray x3071 or 332-5892.

'80 Chevy. fleetside pu, beige 6 cylinder, std. Lou x2886, 482-2587 evenings and weekends.

'79 Oldsmobile Cutlass Supreme Brougham, small V8 (24 mpg highway) AM/FM ac at landau top. Excellent condition. 486-1674 after 6 pm.

'78 Camaro, good condition, automatic, a/c, am/fm radio, $5000. Tracy, after 5 pm except weekends 482-8425.

Miscellaneous

For sale: Table saw and stand $75. Robbie x3188 or 333-5510 after 5 pm.

1/3 carat diamond engagement ring pear shaped beautifully cut stone, setting is white gold. $375.00 or best offer . x6158.

For sale: Microcomputer systems and peripherals. SWTP6802 system,

SEND YOUR COST REDUCTION SUGGESTION ON JSC FORM 1150 TO COST REDUCTION OFFICE, BE *Cartoon by Russ Byther*

minifloppies, terminal, printer, Hewlett-Packard 85 computer, digital plotter. Doug x2676, 474-9247 after 5 pm.

Dear Santa: Please send BB some transparent tape, printing calculator paper (2-1/2"), ballpoint pens, writing tablets and paper clips.

Retirement party for A. W. Patteson January 9. For information call x6287 or see bulletin boards for notices

For sale: Tennis rackets - one head pro 4/38, two Yamahas one 4-1/2, one 43/8 after 5 pm. 486-9332.

Blue-Bonnet Bowl tickets U.T. vs N.C. - yellow section. Excellent parking. Pass cost $77 - sell $62. Smistad x6467, home 488-2267.

New bow: York Compound Bow 2 mo old $135 firm. 486-7611

Whirlpool Dishwasher, yellow, chopping board top, 1 yr. old $250. 12 string guitar - Crestline - $150 exc. cond. Call Don at 486-7611 between 10 & 9 Mon. - Sat.

For sale: New brown fine leather Neiman-Marcus boots-$70. After 6 pm call 474-4626.

2 complete sets of used golf clubs - one mens/other womens w/bags 334-1177.

Monroe electric printing calculator, $35 Olivetti electric typewriter/accounting machine; $150, or will trade. Jim 486-8564.

Wanted

Wanted: HI-FI stereo car speakers. Call Dave x5161 or 474-3401.

Wanted: TR6 hardtop. x3188 or 333-5510 after 5 pm.

Wanted: 1 H.P. electric motor. Call 482-7042 after 5 pm.

Boats & Planes

For sale: 16 ft. Fiberglass boat - no engine. Trailer excellent for bay fishing or shrimping, 337-1938.

Pets

AKC Schnauzer stud service: Platinum silver, champion bloodline, 13" at shoulder. Also, rabbits and wire cages. x6178 or 331-6690.

Black male AKC reg. Toy Poodle. 4 yrs old, shots, $75. 944-7042

Lost mid-October, Large, black, long-haired cat. Armand Square/University Green Area. Tag and collar. $100 reward. 480-2549.

Household Articles

For Sale: Two large air conditioners. Good condition $100 ea. or best offer x6158.

Large capacity portable dishwasher, excellent cond., gold with wood formica top $150. Carolyn x2991, 480-2896.

For Sale: Trash compactor $100. Barbara 333-2555, 488-1514.

Twin beds w/mattresses & boxsprings, matching bedspreads, like new, $85 each. x3991, 488-8699.

Musical Instruments

Clarinet in very good condition $100 - Yamaha. Call Garza x4776, 938-0126 after work.

Gibson Guitar, Model L6S. Mint condition. Hard case and picks included. $750 value for $495. Joe, x6406 or 944-6513 after 6 pm.

For Sale: Fender super - six amp $600. Kustom Base Amp. 250 watt $400. Together - $950. Call Leon x5441.

Stereos & Cameras

Heathkit GR-295 color 23" TV 7 yrs old with manual and replacement tubes. Walnut cabinet, $225. 944-7042, E52/Joseph Rogere, x3576.

Console stereo/radio, needs repair, $20. Kathy, 488-8699.

Property & Rentals

Lease: Baywind 2 condo, 1 bedrm., fireplace, next to pool and tennis cts., $290/mo. + elec. 483-5511, 850--1520.

Sale: Beautiful 4-2-1/2-2A, formals, family room with fireplace, custom drapes, new carpets and kitchen appliances built-in microwave oven, 7-1/2% V.A. loan. 482-3809.

Wanted Clear Lake area, 4 br., V.A. or FHA quick cash 483-5301 or 482-6609 after 5.

For Lease: Bacliff Villas, 3-2-1, 2 yrs. old brick, energy efficient, $400/mo. Charlie x6471 or 474-5098 Eve.

For Lease: 1-br. Baywind Condo, Clear Lake City, nice view, $295. Barbara 333-2555 or 488-1514.

Rent: To conscientious and non-smoking male, one bedroom with kitchen & laundry privileges. 6 miles from NASA, $160/mo. Call Jeff x7429 or 482-5393.

House for lease: Wedgwood, 3-2-2(D), oversized MBR fireplace fenced. Convenient location, well-maintained. Available Jan. 5 $450/mo + dep. Call 488-5541 (Wknds, evenings 483-3631, 9-5).

For Rent: Galveston By-The-Sea Condominium. Two bedroom furnished apartment for rent by day, week, or month. Clements. 474-2622.

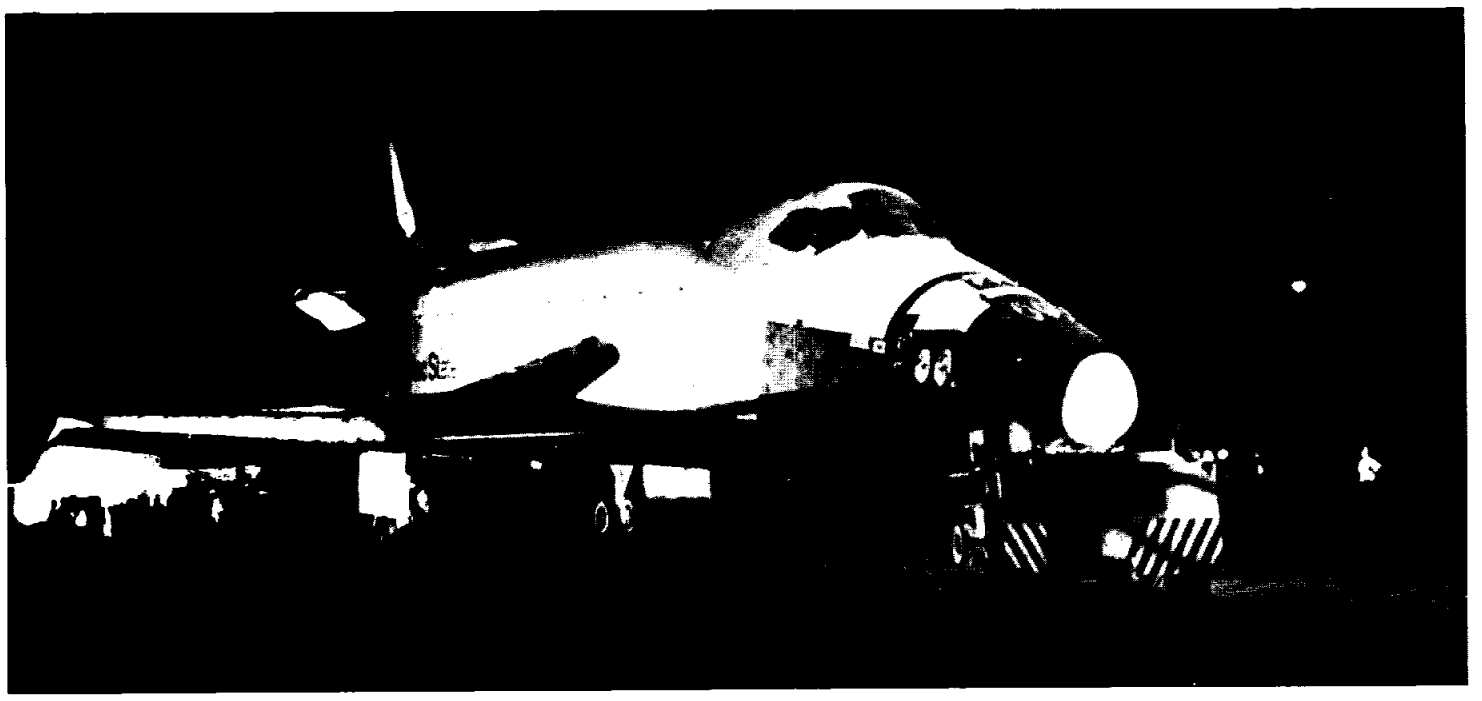
Carpools

Want to form carpool from Dickinson to Bldg. 30 area. 8:00 to 4:30 shift. Gianna x-4481 or 534-3927.

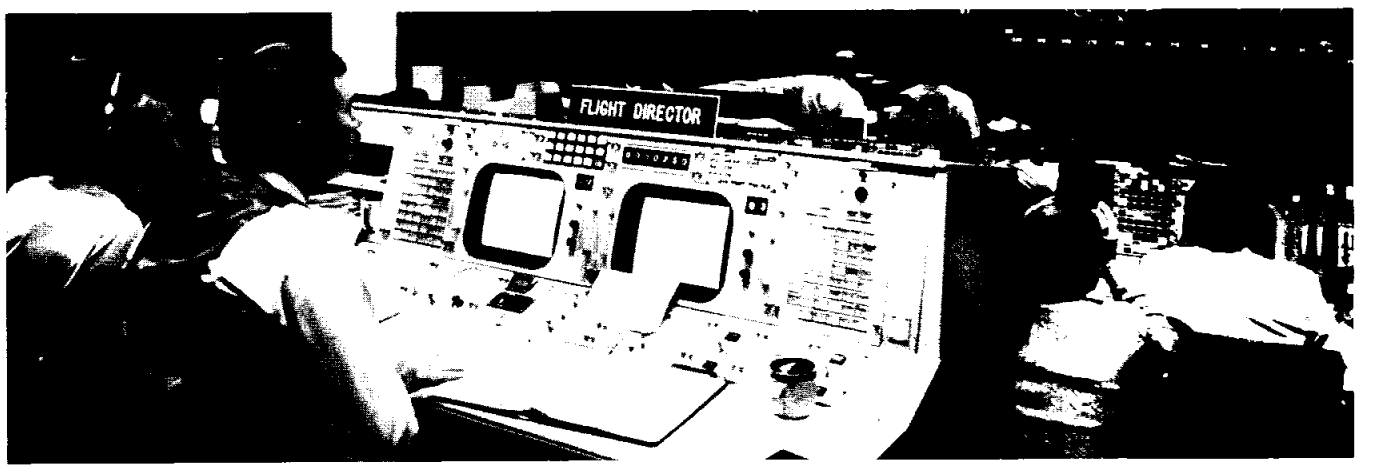
Non-smoking riders wanted 8 am to 4:30 pm shift. Rayburn High School area. Fisher x5341 or Pixley x4751.

Paying rider wants ride from Gordon St., Alvin to JSC main campus. Hours arrangeable. x3205 or 331-4351.

1980, the year in review



Columbia roll-out last month (left) was a milestone in progress towards the first STS mission. The vehicle spent most of the year in the processing facility at the Cape where work such as tile installation (above) was completed.



The prime crew trained in 1980 running pre-launch tests onboard Columbia (top left). Above, mission simulations ran to perfection at Houston, where at least two days a week, ground crews trained in Mission Control Center. Meanwhile at Jet Propulsion Laboratory in California, NASA made history with the acclaimed Voyager fly-by of Saturn, as portrayed by the montage of Voyager imagery shown at left.

The future looks bright for space projects

Employees invited to speculate on NASA in year 2000

At this time of a new year, we sat down to speculate on what space operations will be like in the year 2000, and wrote the following.

Why not give us your ideas? If you're inclined to daydream or have visions of the future, write them down and send them to AP3 Roundup. Let's see what people around the center see as the future for space activities.

Based on the progress we're making today, in the year 2000 there will be a number of construction sites in near Earth orbit. The first industries which will move into space are likely to be those dealing in metals, pharmaceuticals, glass for lenses, and electronic crystals.

The scene 20 years from now would be employees—technicians, engineers, scientists, and others—working shifts in orbiting modules, probably owned and operated by corporations that don't exist today. They would "commute" to attached habitability modules, and probably serve a portion of the year tour of duty in space with a few months living at home on Earth.

However, some more activist space exploration advocates—including members of Congress—want to begin plans for manned stations to be built on the Moon or Mars. The technology is there today, it only takes a push—much like Kennedy's goal to reach the Moon set in 1961.

It is possible there would be mining camps and launch sites on the Moon or Mars. We know the Moon contains metals in its soil, in a free-standing state, without non-metal elements attached. A Moon mining base could provide materials for a metals construction module in Earth or Moon orbit where astronaut workers would process high strength lightweight steel for use at the space construction site and also to transport to Earth.

Some people in the scientific community—Gerard O'Neill of Princeton, Isaac Asimov among them—see all polluting industry moving into space so Earth can be like a preserve, or park. They write about whole pieces of the population moving out into space—Mars, the moons of Jupiter—or huge orbiting structures the size of cities—to start colonies. And some of them think it could be done in the next 20 years, or at least started.

There is a popular theory that you could take some basic elements with you to Mars and add them to the elements there in the soil to create an atmosphere like Earth's over a period of years, or faster inside a dome-like structure. This process is called Terra-forming and it could be in the beginning stages in 20 years.

More than likely we will be just in the middle of cashing in on the Boom that a new frontier such as expansion into space will create. Space technology grows into new industries, new corporations—such as Comsat and Satellite Business Systems. It's hard to speculate who will be the new millionaires, the new industrialists who grow out of the "third industrial revolution" that we are seeing the beginnings of now.

In metals, a study conducted by TRW for NASA identified more than 400 alloys that cannot be made on Earth because of gravitational pull. Metals constructed in space could be anywhere from 100 to 1000 times stronger than they are today.

Pharmaceuticals, especially vaccines, can be produced more effectively in reduced gravity.—Skylab and Apollo Soyuz experiments have also shown that it's possible to create new types of glass and grow near perfect crystals to sizes 10 times larger than on Earth.

But the main difference between then and now is there will be people whose normal working environment is a space station. They will have adapted to floating from one place to another, and eating rehydrated food. They will have to stick to a physical regimen to counteract some of the biological problems in reduced gravity—blood rushing to the head and leaving the lower extremities, bone and muscle loss. But we'll learn to adapt, and space will be just another place where people live, work, and produce.

Modules in orbit will be powered more than likely by nearby satellites that beam the sun's energy. They will also likely use fuel cells, which have pure water as a by-product. Both these concepts have spin-off potential for use for Earth.

Voyager Two, now headed for its August 25 encounter with Saturn is presently 1,194,436,000 km from Earth, 221,532,000 km from Saturn. It is traveling at 205 km/sec velocity relative to Earth.