

# Space News Roundup

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National Aeronautics and Space Administration

## News Briefs

### Ariane 3rd stage cited

Mission officials believe a third stage propulsion problem led to a loss of altitude and forced the destruction of Ariane V15 about 10 minutes after it was launched from Kourou, French Guiana on Sept. 13. The launch had to be aborted because the rocket threatened inhabited areas. European Space Agency officials said. The rocket was carrying two communications satellites, Spacenet F3 for GTE Spacenet Corp. and ECS-3 for the European Communications Satellite System. Since 1981, Ariane has successfully launched 17 satellites of varying types. Two early launch failures, on Ariane L02 and Ariane L5, resulted in the loss of four satellites, two of which were large comsats.

### CCTV to show photos

The JSC closed circuit television system will begin showing portions of the mission photography from upcoming Shuttle flights. Center Operations announced last week. The programs will be aired on the second and third days following landings. The programs, about 25 to 30 minutes long, will be repeated continuously throughout both days to allow ample opportunity for viewing.

### Allen updates book

"Entering Space" a book written last year by former astronaut Joseph P. Allen, has been revised and enlarged to include his first hand account of the STS 51-A dual satellite retrieval. The first edition of the book was going to the printer in February 1984 when the Westar and Palapa satellites were deployed — but failed to reach geosynchronous orbit — on STS 41-B. Allen writes that his most nerve-wracking moments came not during the MMU flyover to Palapa, nor when he held the satellite over his head for a full orbit of the Earth. Rather, it was during the second EVA, when he was standing at the tip of *Discovery's* robot arm. "Because of my helmet's limited visibility, I could not see my feet, nor the rail at my side; only my knock-kneed stance kept me in the foot restraint . . . it was like standing on the tip of the world's highest diving board."

### AFTI wing to fly

The first flight of the Advanced Fighter Technology Integration F-111 aircraft with a revolutionary new wing called MAW was set to take place in the next few days as the *Roundup* was going to press. MAW — for Mission Adaptive Wing — is a wing that can change its camber and wing sweep to adjust to varied flight conditions. The variable camber (fore and aft wing curvature) capability is expected to allow optimum efficiency at supersonic, transonic and subsonic speeds by adopting the best wing shape for each speed regime. Current plans call for 15 test flights in the initial phase of the program, where the wing will be subjected to gradually increasing speeds, up to Mach 1.05. The flights will take place at NASA's Dryden Flight Research Facility.

JSC has embarked on a new way of doing business. It's called

# STSOC



The space program reached a significant milestone Sept. 12 with the selection of Rockwell Shuttle Operations Co. for negotiations leading to an award of the Space Transportation System Operations Contract (STSOC).

The package is, quite simply, one of the largest aerospace contracts of its type ever. Everything about STSOC (pronounced STEE-sock) is huge, including the size of the winning contract proposal. It was presented to NASA in the form of three ring binders—lots of them—about 3,600 pounds worth.

The two-year award, with a two-year priced option, will be for services beginning Jan. 1, 1986. Rockwell's proposal reflected a four-year cost of approximately \$685 million. Ultimately, follow-on awards could result in a total contract period of 15 years and a total value of about \$5.5 billion.

Rockwell Space Operations Co., a newly formed subsidiary of Rockwell International, will grow from a local employer of about 500 people to an employer of some 3,500 people by Jan. 1 when the contract takes effect.

What makes STSOC different from any other large government contract? First, STSOC is a management oriented contract, covering administration and people more than hardware. It covers six major functions within the overall bailiwick of Shuttle mission operations. That includes much of the work done in such major JSC facilities as the Mission Control Center, the Shuttle Mission Simulator, the Shuttle Avionics Integration Laboratory and the Central Computing Facility.

Specifically, Rockwell will be responsible for the performance of project management, maintenance and operations, sustaining engineering, flight preparation requirements and analysis, flight

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## Griffin stresses R&D productivity

The U.S. faces a national challenge to improve quality and productivity and NASA can be a leader in meeting that goal, JSC Director Gerald D. Griffin believes.

Speaking at a gathering of aerospace officials at a conference on research and development productivity, Griffin said the U.S. space community faces four fundamental challenges, but meeting those can help the national economy and America's position in the world marketplace.

The conference, "R & D Productivity: New Challenges for the U.S. Space Program," was held Sept. 10 and 11 at the University of Houston-Clear Lake, concluding the day before the STSOC contract award was announced. STSOC itself was cited as one of the more visible elements of a NASA-wide effort, which has been underway for three years, to streamline, reduce overhead and improve efficiency throughout the Agency.

The meeting was co-sponsored by JSC, UH-CL, the American Institute of Aeronautics and Astronautics and the American Productivity Center.

Some 500 aerospace industry officials and representatives of university and government organizations attended the conference.

"The United States is faced today with an unprecedented challenge to its worldwide position of economic leadership," Griffin said. "It doesn't take much insight to recognize that productivity improvement and quality improvement are the fundamental ingre-

"The first of these management tasks involves each of us in our own organizations. We must provide a setting that offers a challenge and a stimulating future to our people. Our objective is to make every employee feel that he or she has a stake in making the

NASA Employee Teams have been formed and are making inputs to management on ways to improve efficiency. Those inputs have resulted in the savings of hundreds of thousands of dollars. During Fiscal Year 1984, a revitalized Employee Suggestion Program more than tripled the number of suggestions received over the previous year, and the processing time for those suggestions was cut in half. A National Management Association chapter was initiated at JSC, offering training sessions and social gatherings designed to provide interaction among employees on issues related to management.

Center wide, the STSOC and FEPC contracts will offer significant improvements by streamlining organizations, reducing the number of interfaces between program elements and reducing overhead, he said.

Griffin said managers must be ready to use new ideas and new techniques. "We must question why we do business the way we do. We must examine the new technologies and new management concepts which are becoming available and select those which will improve the effective utilization of the resources assigned to us."

**"We must provide a setting that offers a challenge and a stimulating future to our people."**

dients in helping to reinvigorate America's competitive strength. NASA, because of its position at the leading edge of many of the new technologies, has a special role in helping the nation meet this challenge."

Griffin said the American space community faces four major tasks in the future. "In the near term, our two biggest jobs, of course, are Space Shuttle and Space Station — programs offering both challenges and opportunities which are substantially different from previous space programs."

The two other challenges, he said, are management related.

U.S. space team more effective and efficient.

"The second management task relates primarily to our relations with other organizations. We must strengthen our joint government/contractor and university working relationships," he said. "We have to look for new procedural ways to improve our day-to-day interfaces."

JSC's efforts in meeting productivity goals have produced a series of accomplishments over the past three years, according to Les Sullivan, Chief of the Management Analysis Office. Several



## Milestone reached with new contract

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preparation production and direct mission operations, testing and support.

Secondly, the contract implies a long duration commitment. Rockwell not only will take over the work now being performed by 16 different companies, but also will step into work now being done by government employees. JSC Director Gerald D. Griffin has listed this as one of the most important aspects of STSOC, freeing up government employees for a large in-house effort on the Space Station. That in itself is a major departure for the government, but one which is seen as necessary because the Space Station is, by definition, a permanent facility. The government wants to build and retain its own in-house systems engineering and integration capability, or SE&I, for the Space Station, a program which is intended to encompass, at minimum, some three decades or more of work.

STSOC is the second of three supercontracts NASA will award

as it moves into routine operations of the Space Shuttle and clears the decks for the Space Station program. The contract is a consolidation of 22 separate work packages heretofore performed by 16 different companies. NASA sees long term consolidated contracts, in which inducements are offered for reliability and efficiency, as the best way to handle the growing

space operations business.

In 1983, NASA awarded a \$1 billion contract to Lockheed Space Operations Co. to cover three years of processing of the Shuttle and its payloads at the Kennedy Space Center in Florida. A priced option for a second three-year period has been valued at \$1.3 billion, and NASA also has another nine years worth of options on

the contract. Total value: upwards of \$5 billion.

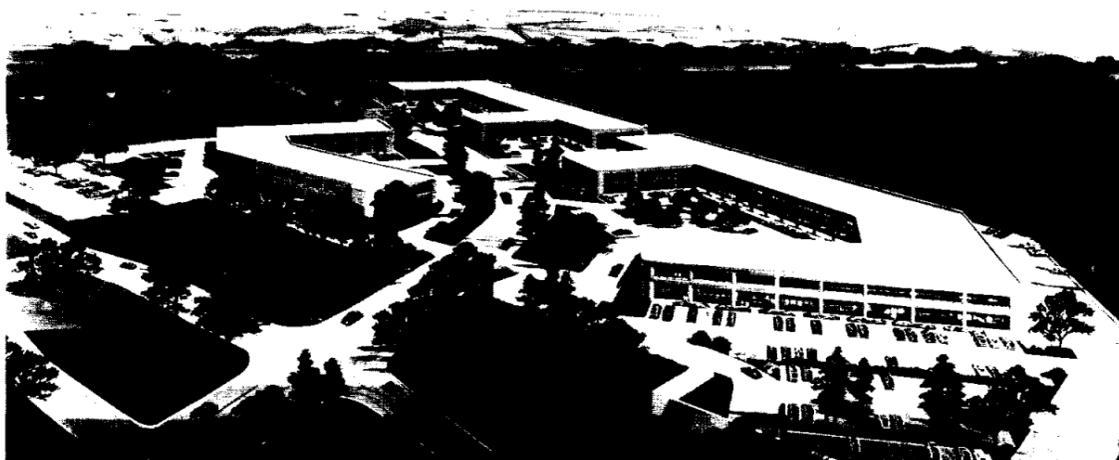
The other major contract, called FEPC (FEE-pack), is for flight equipment processing at JSC. Valued at \$58 million for the first three years, the contract is not as colossal as the other two, but is every bit as important. It will consolidate all the work that has been done under 15 different

agreements, and involves the work necessary to put all the equipment aboard Shuttles that the astronauts use—everything from clothes and cameras to eating utensils and repair tools. FEPC is due to be awarded in October.

Other corporate members of the Rockwell team are Bendix Field Engineering Corp., Columbia, MD; System Development Corp., Camarillo, CA; Omniplan Corp., Santa Monica, CA; RMS Technologies, Inc., Landover, MD; and System Management American Corp., Norfolk, VA.

Rockwell will be managing the contract out of a new 350,000 square-foot facility on Gemini Ave. near Bay Area Blvd. The first phase of the new headquarters complex is scheduled to open in December, with the rest to be complete in the spring of 1986.

In addition to Rockwell, proposals were submitted by Ford Aerospace and Communications Corp., Space Information Systems Division, Houston; Grumman Space Operations Corp., Houston; and Lockheed Space Flight Co., Houston.



An artist's concept of the new headquarters for Rockwell Shuttle Operations Co.

## FEPC, due next month, is next consolidation

A \$57.6 million contract for the processing of space flight equipment is due to be awarded by the end of October in JSC's second major contract consolidation.

Following on the heels of STSOC, the three-year Flight Equipment Processing Contract, or FEPC, will consolidate jobs currently being done by 15 firms.

The contract will be for the processing of almost all flight hardware used by Shuttle crews, and for the operation and main-

tenance of associated ground support facilities. Some 1,500 items are put aboard Shuttles for each flight.

FEPC (pronounced FEE-pack) could be worth over \$300 million over a 15-year period, according to Frederick T. Burns Jr. of the Shuttle Flight Equipment Project Office. The initial contract award will cover three years with a two year option. There are two additional five year options to the contract.

There are three teams with proposals under consideration by the source selection board. Hamilton Standard, ILC and RCA comprise one team; Boeing Aerospace and Wornick Corp. comprise another; and General Electric, Northrop and Integrated Systems Analysts comprise the third.

A Request for Proposal for FEPC was released in January. Bids were received in April and the selection process has been

underway since. Two other firms, Lockheed and Pan Am, have already been informed their bids were not within the competitive level for the contract.

FEPC processing will include such flight equipment as spacesuits, clothing, flight kits, tools, film and personal hygiene items.

The FEPC contractor also will be responsible for testing of the spacesuits before and after flights, as well as testing and maintenance

of the Orbiter galleys. Other responsibilities of the FEPC contractor will include operation of the space food production facility and maintaining the medical supplies and equipment carried aboard.

The contract will be a cost-plus-award-fee for the first six months, and then will become a cost-plus-incentive-fee contract, plus an award fee, for the remainder of the term.

## \$1 billion CLC development planned

A five- to ten-year "second generation" development plan for Clear Lake City, with an investment value of about \$1 billion, is seen as a major step toward making the area a hub for future commercial space ventures.

"NASA is the key," said L.J. "Roy" Pezoldt, Vice President of Friendswood Development Corp. and Project Manager for Clear Lake City and Bayport. "NASA provides the stability for this area and it will make the private sector growth possible."

Plans call for commercial and residential projects on 4,000 acres owned by Friendswood Development, a subsidiary of Exxon Corp. Construction will include 2,375 new homes and 5.6 million square feet of commercial office space, Pezoldt said.

"Our plans follow the master plan but the timing has to corre-

spond to the market demand," he said. "The fact that the Space Shuttle is an operational, proven system and that the Space Station has been funded are the key factors to the development of this area."

Pezoldt said the STSOC contract is significant because "it involves a lot of activity and it also makes the NASA program more effective. It demonstrates that NASA is making plans for long term space operations."

Pezoldt said the prospect of commercial space enterprises was an important consideration for the development plans. "Without the Space Shuttle, the Space Station would not be possible. Without the Station, commercial activity in space would not be possible. This work will open up the whole frontier."

Plans call for \$560 million in

construction of five new commercial centers, bringing Clear Lake City's office space total to nearly 8 million square feet. The construction also will entail a major new entrance into the area, Choate Road, which will be an eastward extension of FM 2351 just south of Ellington Field, and an extension of Hercules across El Camino Real to Hwy. 3 where it will intersect with Medical Center Blvd.

Three new residential areas will be created: Bay Knoll, Bay Glen and Bay Forest, and the Meadowgreen subdivision will be expanded.

The five new commercial centers include:

- Bay Terrace, a 150-acre project. Located on either side of the Hercules and Medical Center Blvd. intersection at Hwy. 3, the center will include professional

and service buildings, retail and multifamily housing. Adjacent to this project is Clear Lake Central Business and Technology Center, already under construction on 21 acres by Amelang Partners. Located at Bay Area Blvd. and Gemini, the center will include the new home of Rockwell Space Operations Co.

- Corporate Plaza, located at Bay Area Blvd. across from the University of Houston-Clear Lake. The site now includes One Corporate Plaza, completed late last year. Friendswood plans to build two 8-story office buildings, one 6-story building and a 300-room hotel on the site.

- University Park, a 150-acre site located northeast of the University on Bay Area Blvd. at Middlebrook Dr. A central feature of this site is the 410,000 square foot IBM building under con-

struction. The project will be connected with Space Center Blvd. by a new road through the University campus.

- Bay Forest Commercial Center, adjacent to the new Bay Forest community on Space Center Blvd. and near the McDonnell Douglas tower, will be a 20-acre office park with one and two story buildings.

- Retail Center, located at El Camino Real and Pineloch. This 20-acre project will include a supermarket and other retail stores.

Another commercial center under development is at the intersection of NASA Road 1 and I-45. Bay Pointe Technology Park, being developed by Bay Pointe Joint Venture, is a mixed use 200-acre project which will include research space, retail buildings and a hotel.

# How it will work

Managers Kranz and Minor discuss the new contract and the future

## Eugene F. Kranz

Director, Mission Operations



**'It's going to save us some money and it's going to maintain the quality of the process.'**

**Roundup:** Now that a contractor has been chosen for negotiations leading to the award of STSOC, what message would you have for the people of MOD?

**Kranz:** Well, to a great extent, I think there are really several messages involved. The first one is we are now establishing the direction that we'll be moving in for the future. There is no question that we're into the higher flight rate in the program and I believe that the STSOC will provide the stability that we need in order to satisfy that flight rate. It will also provide, I think, the stability for the contractor base, because they know they are going to be here for a long period of time. The association we developed with MacDac and Ford for the first 25 years of the space program provided the capability and continuity as we moved through each one of the phases of the previous programs, and we are now at a point where STSOC will provide that same continuity for the STS program that is needed to allow us to be successful in the job that we've got to do.

**Roundup:** By all indications, you are a big believer in morale. Are you concerned about morale with this transition underway?

**Kranz:** To some extent, I worried about it when the original concept of STSOC came up, but I believe the incumbents we've got are all professionals. They recognize the responsibilities that we jointly have with them in assuring a successful program. In the same fashion, the Rockwell STSOC team is a highly competent and professional organization and I believe we'll accomplish this transition and phase over very smoothly because we are working in an environment that does not tolerate anything but professionalism, and the people we've got are professionals. So I have limited concern relative to the morale of the organization. There has been

some uncertainty, and now that the uncertainty has been resolved, I believe all of the players are going to step up and fulfill their responsibilities. As such, I believe the transition will be difficult only to the extent that we have new people who have to be taught the jobs and it comes at a point where we have critical activities going on, like the first Vandenberg launch and the Centaur missions. But we understand the process of preparing the missions, and with this understanding of the process and the competence of the contractors, both the incumbents and the Rockwell STSOC team, I have limited concern.

**Roundup:** You mentioned stability. How exactly does STSOC contribute to stability?

**Kranz:** Well, the key thing is the people knew a change was necessary. It was very difficult to manage all the contracts across all the facilities and missions, and it resulted in a relatively high overhead. The basic concept of consolidation of contractor activities, as well as the mission activities within Mission Operations, is a correct one. We just finished a very large reorganization where we picked up parts of GDSD, MPAD and some of the responsibilities in the areas of flight software. This concept is right because we need to not only

reduce the overhead, we need to promote the efficiency of the entire process. Through this activity, we'll be in a much better position not only to save money, which is one of the prime objectives, but to tighten up and reduce the number of interfaces, which was one of my primary objectives. In itself, that will help in maintaining the quality of the overall process. To me, maintaining that quality is the real overall goal of the STSOC. So I believe we are in an excellent position to improve the quality, and knowing now that this contract has the potential for running for 20 years, it can provide stability for those new people coming into the program. They know that if they want to stay with the Shuttle and they do a good job, they will be here, they have a guaranteed future. And that is important for the young people we want to bring into the system.

**Roundup:** Will civil service employees in MOD be seeing a change as well?

**Kranz:** At the current time, and for a period of time as we move through the transition, there will be no discernable change from a civil service standpoint. The principal change that will occur over the next two years is one of civil service focusing, where we've got several areas where we want to focus our civil servants. Those are in the areas of policy decisions, of significant customer interface and involvement, areas where I have significant real time decisions to be made. And then I've got a series of ancillary jobs, so we will be basically focusing the civil servants in these areas over about the next two years. We're working on a plan right now that hopefully will provide some visibility to the people that are involved as to the direction of the organization, and to some extent, the direction that they will have in the future. I don't expect

any dramatic changes. I expect a series of evolutionary changes as we recognize where it may be to our benefit to move civil servants out of certain jobs here in order to allow us to better focus in areas where we need personnel for the STS as well as to start building the capabilities we need to start supporting the Space Station.

**Roundup:** Do you expect to see any shortening in the time it takes to train a flight controller. Do you want to see any shortening?

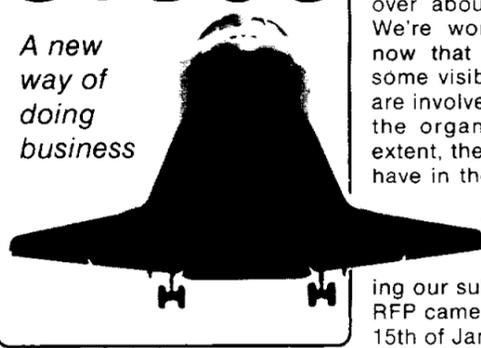
**Kranz:** We have not seen any discernable changes. When you talk about shortening the training of flight controllers, you must recognize that about two years ago, we realized that attrition was becoming a very significant problem for us. As such, we did a large amount of restructuring and, in particular, formalization of the training process for each member of the flight control team. Such that, when a new individual comes on board, we have a very definitive plan that moves him or her into a point of direct mission participation in the shortest way possible. We did this not only to solve our attrition problem, but to bring more people into a capability to work missions at an earlier time. So the process has been shortened but it was more a response to the need rather than a deliberate, overt attempt. Personally, I tend to believe that the longer term training process with a large amount of OJT, a large amount of communication with other controllers, bringing people into the missions gradually, was the best way to go. I think we will arrive at the same quality of people in the process, but I don't know if we will have the same depth we've had before. You just cannot communicate the experience of the people working around you over a shorter period of time. To some extent, that is compensated

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### Interview

## STSOC

A new way of doing business



## Robert G. Minor

President, Rockwell Shuttle Operations Co.



*Robert G. Minor, President of the newly created Rockwell Shuttle Operations Co., is the former Program Manager for Rockwell's Orbiter Program and a veteran of the Shuttle effort since the early 1970s. During the Orbital Flight Test Program, he was Rockwell's Chief Engineer for the Orbiter. His educational background is in avionics and software. This interview with Minor was conducted Sept. 18.*

**Roundup:** Now that the announcement has been made, one suspects the real work is only just beginning. What comes next?

**Minor:** The number one priority to us now, and the place where we have jumped in with both feet, is the staffing of our team. Certainly we have a partial management team put together, but our next big step is to bring on and get signed up the people that have been doing this work in the past for the different companies like Ford and Singer, MDTSCO and others. As you may know, we are starting a series of briefings to those people, where for a week in the evenings over at the University of Houston-Clear Lake we're going to tell those people who we are and what our organization is, what our benefits program is and how we are going to honor their service time. We'll try to make them feel like a part of the team. We want to have a full staffing complement before the start date on the first of January. Now, that's number one. The other thing we are doing in parallel with that is we have had a very preliminary meeting with NASA management on Tuesday. Next week we hope to start the fact finding and negotiation phase of the contract, which of course is also very important. So

**'The first right of refusal goes to the people who are doing the work today.'**

those are our two immediate goals: the acquisition of the people and the negotiation with the customer.

**Roundup:** Those are difficult tasks, especially in view of the fact that you have to hit the ground running in January.

**Minor:** That's correct. Both of those are very challenging though we have spent a lot of time in preparation for this, and, in particular, for the staffing. We already had our strategy worked out as to how we were going to interface with the people who are doing the work today. That strategy has already been worked out, but of course pulling it off is always tough. The negotiation process we think we are ready for, but you never know until you get into it. We've done a lot of homework, but it will be back to those six and seven day weeks for awhile until we accomplish both of those tasks.

**Roundup:** The STSOC team at Rockwell, and no doubt at the other bidding companies as well, has been working quite a few six and seven day weeks, has it not?

**Minor:** Yes, it all really started in earnest about 18 months ago. Even earlier than that, as a matter of fact, but we all started working very hard on it about 18 months ago. Prior to this job, I was the program manager on the Orbiter back at Downey, and made up my mind after the STSOC job was offered to me to take this on as a challenge, and I actually started doing this pretty much full time in June of '84. It's been a long hard task, and that's been true for most of the people on the team, includ-

ing our subcontractors. When the RFP came out around the 12th or 15th of January, we worked seven days a week, twelve to fourteen hours a day and didn't have a day off until we submitted the proposal on the 24th of April. I think we took one weekend off and then we started back to the seven day a week thing through the orals and the best and finals, which was the 8th of July. It sounds like a lot of hours, but that's just the kind of preparation and time it takes to be able to pull something like this off. It's a lot of work.

**Roundup:** The milestone we are at now, of course, is really just a precursor to a big transition for thousands of people around JSC. There are a lot of folks whose future is affected here. What sort of philosophy are you bringing to this to make the transition easier?

**Minor:** Well, the first thing is, as far as we are concerned for all of the jobs we have, the first right of refusal goes to the people who are doing the work today. We are going to give them the opportunity first to fill those positions. That's always been our philosophy and we are going to follow through with it. We are particularly going to concentrate, in the next month, on getting those people to these meetings we've talked about to sign up. They won't physically come to work for us, at least very few would, until January, but we need to get them on our team so we can count on them. So the first right of the job goes to them, as far as I'm concerned. Secondly, we are striving to assure that their service time applies to them on this team. So from a vesting standpoint and a retirement standpoint, those years that they were with another company like Singer

or Ford will apply here with our team. It also will be honored toward their vacation time, so, for example, if someone has been with a company for 20 years or so, they would come right in from day one and pick up and have their four weeks of vacation and things like that. We're trying to do everything we can to make them feel that they're not changing teams, but really continuing, maybe with another company, but they'll not lose those years they put in in the past.

**Roundup:** Morale is an important part of this business. Easing the transition must be one of your chief concerns, and NASAs'.

**Minor:** I'm sure that was one of the evaluation criteria, and I'm sure each company had their individual strategy, but yes, that was ours and we considered that a very high priority.

**Roundup:** This is a massive influx of employees — somewhere around 3,500. Given that, was it possible for Rockwell to use the same group health and insurance plans as you now have, or did you have to go out and start from scratch?

**Minor:** Well, what we did was form a wholly owned subsidiary, Rockwell Shuttle Operations Co. and as a result of that, we used our past experience and knowledge with benefits programs and insurance companies that we've had for many years. We put together a new plan, we think it's unique. It keeps costs in mind, but I don't think it penalizes the people in any way. Our team is unique. One of the things we did early was that Rockwell, Bendix and SDC are sharing a common benefits plan. We each have our

(Continued on page 4)

# Kranz

(Continued from page 3)

by the higher flight rate. If you fly 8, 10 and 12 missions a year, you acquire experience very rapidly. So we're trying to take advantage of the higher flight rate and a much more dynamic training program to bring people into the system faster. It's going to be a year or two before we can truly assess whether we have maintained the quality in the process. Quality is our key objective.

**Roundup:** With a higher flight rate comes the potential for an increase in overtime or comp time hours. Are you seeing that?

**Kranz:** We are seeing an increase in several areas. The principal increase is in the area of leave time lost, where the people do not have the opportunity to take annual leave that should normally be afforded to them. The overtime

people to work on the source board who are going to be many of the key managers over certain elements of the STSOC contract. So basically I used that as an opportunity for training my people, who will be the technical managers, what they call TMRs, technical manager representatives, for the contract. I also had several people working on the contract management scheduling activity, as well as the technical direction to the level of effort side of the house. So we had broad coverage on the source board and that activity stayed on schedule until the very end, and it was a highly competent professional effort.

**Roundup:** STSOC has been called a "supercontract," as much due to the amount as to the duration, and it has been described as a departure for the government. How

do you characterize it?

**Kranz:** I really don't know whether the government is making a major departure, but it is a major departure here at JSC and it's a concept whose time has come. It is extremely important when you consider the generic nature of the



Space Transportation System. The STS has to provide a reliable, routine, cost effective meth-

od of moving customers' payloads into space. STSOC provides us the opportunity to reduce the total overhead in managing the many contracts it took in the past to accomplish that job here at JSC. It also provides a significant incentive to the contractor to improve his overall performance. From my standpoint, it's a heck of a lot easier to manage a single contractor rather than multiple contractors. I believe the quality assurance of the entire process should be simpler because we have one contractor overseeing the total scope of activity. As such, it is a supercontract, and its super from the government's standpoint. It's going to save us some money, it's going to maintain the quality of the process, and it should provide us with a good understanding of how to approach programs whose duration is 20 years or more. We've never had to manage such a program before, and as such I believe the basic concept is correct and will achieve the majority of its goals.

utilization is increasing to the point where we're averaging about 6 to 7 percent overtime across the board. And if you took a look at it on a specific organizational basis, you'd find it well over 10 percent in some areas. The average still remains low, but certain elements of the organization are working significantly more overtime. Part of the civil service focusing that I talked about earlier is to better level load the organization from the standpoint of the amount of work it takes to get ready for a mission, and to better distribute the work so that certain elements aren't carrying the majority of the load.

**Roundup:** Conceptualizing and carrying out the procurement of this contract, especially for the source board, has to have been a Herculean management task.

**Kranz:** Yes, it has been. The one activity that was very impressive to me, and I saw it only from the outside, was the performance of the source board. I provided personnel to work for Charlie Harlan, who managed that entire activity. It was only after the work had been completed that I got an opportunity to review the results. Any time Charlie Harlan works on activity like this, the results are going to be highly competent and professional. We provided him

## The contract consolidations

Contractor & Contract No.	Partial or total consolidation	Functions being consolidated
<b>Barrios Technology</b> NAS 9-16129 (Small Business)	Total	Flight Preparation Direct Mission Operations Testing Support (DMOTS)
<b>Computer Sciences Corporation</b> NAS 9-15700 (Large Business)	Partial	Maintenance & Operations Sustaining Engineering Flight Preparation DMOTS
<b>Ford Aerospace</b> NAS 9-16315 NAS 9-15014 (Large Business)	Partial Partial	Maintenance & Operations Sustaining Engineering Flight Preparation DMOTS
<b>IBM</b> NAS 9-14350 NAS 9-16920 (Large Business)	Total Partial	Maintenance & Operations Sustaining Engineering DMOTS
<b>Intergraph</b> NAS 9-15534 (Large Business)	Total	Maintenance & Operations Sustaining Engineering Flight Preparation DMOTS
<b>Intermetrics</b> NAS 9-17125 (Small Business)	Total	Sustaining Engineering
<b>Lockheed Engineering &amp; Management Services</b> NAS 9-15800 (Large Business)	Partial	Maintenance & Operations Sustaining Engineering Flight Preparation DMOTS
<b>McDonnell Douglas</b> NAS 9-16715 (Large Business)	Partial	Maintenance & Operations Sustaining Engineering Flight Preparation DMOTS
<b>The MITRE Corp.</b> T-2228K (Nonprofit Corporation)	Partial	Sustaining Engineering
<b>Nelson &amp; Johnson</b> NAS 9-16415 (Small Business)	Partial	Maintenance & Operations Sustaining Engineering Flight Preparation
<b>Northrop Services</b> NAS 9-15425 (Large Business)	Partial	Maintenance & Operations Sustaining Engineering Flight Preparation
<b>Omniplan Corp.</b> NAS 9-16332 (Small Business)	Partial	Flight Preparation
<b>Rockwell International</b> NAS 9-14000 (Large Business)	Partial	Maintenance & Operations Sustaining Engineering Flight Preparation DMOTS
<b>Singer Company</b> NAS 9-15023 (Large Business)	Total	Sustaining Engineering Flight Preparation DMOTS
<b>Sperry UNIVAC</b> NAS 9-16673 NAS 9-16480 (Large Business)	Total Partial	Sustaining Engineering
<b>TRW, Inc.</b> NAS 9-16275 NAS 9-16479 NAS 9-16338 NAS 9-16676 (Large Business)	Total Total Total Total	Sustaining Engineering

# Minor

(Continued from page 3)

own little plan, but it's the same. Vacation benefits, our holidays, our savings plan, our health insurance, all are the same. So one of our strategies was that we should have no competition among the team members. Our benefits programs are identical so there's no reason for a person to feel like they have to go to work for Rockwell, say, because Bendix has exactly the same plan. So far the reaction to our benefits program has been very positive.

**Roundup:** We've talked about the overtime that the STSOC team put in. Overtime, of course, is nothing new in this business. A lot of people are working weekends and holidays and that trend, certainly, will continue. How do you plan to deal with that?

**Minor:** Well, one of the groups of people that truly have, on a continuous basis, the round the clock operations, are the ones who man facilities like Mission Control, the Shuttle Mission Simulator and the computer operations facilities. They are truly up seven days a week, 24 hours a day, almost 365 days a year. Bendix operates a lot of those facilities for us, and they do have a unique plan for how the shifts

are put together, so they can work people in such a manner that they do have time off. Certainly they have to work some overtime. But their shifting methodology helps some of those people not get burned out.

**Roundup:** What we tend to see are certain groups of people who work every third or fourth mission. Sometimes more. Is that the kind of thing you have in mind?

**Minor:** That's true. Of course, we are anxious to share that plan with NASA management. They have to agree with our methodology and we haven't had that opportunity to interface with them in great detail on it. But yes, for example, one of our strategies, with the increased flight rate that we hope will soon be up to 18 and eventually 24 times a year, was to eventually go to seven flight teams. So right off the bat, for example, we have put together our mission manager approach, and there will be seven of these people that will concentrate on a particular flight. They will pick them up in order, one through seven, and then shift around once their particular mission is completed. So we have tried to put together teams of people that could concentrate into groups as high as seven.

**Roundup:** That sounds somewhat like the lead flight director concept

that MOD uses.

**Minor:** Yes, it's very similar to that. We've certainly patterned some of our plans off of talking to the NASA people and finding out what has been successful for them. We've tried to use and learn during the observation period what we thought would work the best.

**Roundup:** Smart machines, smart consoles, artificial intelligence, expert systems — how do those concepts play into your plans?

**Minor:** We certainly see that we are flying both the Shuttle and Space Station, with people up there close to year round, some of the tasks are going to become, we hope, a lot more routine. We believe there is a place in this for expert systems. We are anxiously waiting to work with NASA in developing that strategy. We certainly don't think it's ever going to replace all the people by any stretch of the imagination. But we hope that through the use of those kinds of techniques, it will take the mundane work aside and let the people concentrate on the very challenging things, the unusual. No matter how smart we get, we're always going to need people to solve some of these very unique problems.

**Roundup:** The contract itself, of course, has the potential of running for a long time. Isn't manage-

ment of this sort something of a departure for Rockwell?

**Minor:** Yes, in a way it is. We certainly all hope we'll be operating this magnificent STS system into the next century, we're hoping this will be 15 years plus. And in a way, it is a bit unique. But not as much as you would think. Rockwell is into this sort of business, particularly in the nuclear energy business, where we operate similar types of facilities in Hanford, Washington and also in Colorado. But we looked hard at the STS system, and we wanted to continue to be a part of it.

**Roundup:** When we went operational in '82, there was a lot of talk about having entered a new era. That was, if anything, a sort of hardware milestone, if you will. Now we have STSOC, and it isn't so much hardware as people and administration. Nobody in the aerospace business has ever had a development contract that has lasted much longer than ten years. That's the standard. Does that make this contract something of a new era beginning now in the management of large scale, routine operations?

**Minor:** Well, I guess there is some new ground here that we are plowing. Most of the systems we have used in the past generally have gone for about ten years. That's the lifetime. So to a degree,

this is new for us and for NASA. But if you look at airplane programs, companies like Boeing have been involved with airplanes that have been flying for 20 or 30 years. But for a sophisticated machine like this, we are on new ground. I've seen some tremendous accomplishments in the last year of people figuring out how to do things smarter and better. I think we've just scratched the surface of that.

**Roundup:** While STSOC is not the single reason for the large scale investment in Clear Lake City that we've heard about in the past few days, it is a factor. It points to the kinds of things business can expect from this industry. What are your thoughts?

**Minor:** I do know what Friendswood is doing. We've been associated with them in our new office complex that is going up. I think STSOC is not the only thing, but as the government went forward with this procurement, and right up front said that STS is a long term, stable program, it put a cornerstone on what goes on here in the Clear Lake area. There's going to be a lot more, but it adds some stability and other things will build on it. There are some great things going on, and JSC is going to be the basis of so many things that will happen in this area.

## Crews named for 61-G through 61-K

# Young to make record seventh space flight

NASA has announced astronaut crews for two upcoming Space Shuttle flights and changes or additions to the crews for three other flights.

Veteran astronaut John W. Young will command Shuttle flight 61-J, the deployment of the Hubble Space Telescope, scheduled for August, 1986. Charles F. Bolden Jr. has been assigned as pilot on 61-J. Three mission specialists already have been named to that flight. They are Kathryn D. Sullivan, Steven A. Hawley and Bruce McCandless.

The crew for mission 61-K, the rescheduled Earth Observations Mission set for launch in September, 1986, includes Vance D. Brand, commander; S. David Griggs, pilot; and mission special-

ists Robert C. Stewart, Owen K. Garriott and European Space Agency astronaut Claude Nicollier.

Two payload specialists, Michael Lampton and Byron K. Lichtenberg, already had been named for mission 61-K.

Shuttle mission 61-I, the retrieval of the Long Duration Exposure Facility and deployment of Intelsat VI-1, will be commanded by Donald E. Williams. Other crew members include pilot Michael J. Smith and mission specialists James P. Bagian, Bonnie J. Dunbar, and Manley L. "Sonny" Carter.

Two changes have been made to crews of other flights. Norman E. Thagard replaces John M. Fabian on mission 61-G, the deployment of the Galileo inter-

planetary spacecraft scheduled in May, 1986. Fabian will be leaving the agency in the near future. His plans are unannounced.

Thagard was scheduled to fly on mission 61-H, scheduled for launch in June, 1986, and will be replaced by James F. Buchli.

Young will be making his seventh space flight and his third in the shuttle program with 61-J. He was commander of STS-1 in April 1981, the first mission of the shuttle program, and STS-9, the Spacelab 1 mission in 1983.

Bolden will be flying for the second time. He also is scheduled to fly as pilot on mission 61-C in December, 1985.

Brand and Griggs were reassigned from the Spacelab 4 mission, the first dedicated life sciences



John W. Young

met in orbit. Griggs was a mission specialist on flight 51-D in April, 1985. Stewart was the second astronaut to fly the Manned Maneuvering Unit on mission 41-B and also will fly on STS 51-J. Garriott will be making his third space flight. He was a member of the Skylab 3 and STS-9 crews. Nicollier will be making his first trip into space. Williams was pilot on flight 51-D. Smith is scheduled to pilot mission 51-L in January, 1986. Bagian and Carter will be making their first shuttle flights. Dunbar is scheduled as a mission specialist on the Spacelab D-1 flight, 61-A, in October. Thagard will be making his third flight. It will be Buchli's second flight.

## Telephone contract is signed

JSC's antiquated phone system, which dates back 23 years to the very earliest days of the Manned Spacecraft Center, is being updated.

A \$14,938,000 contract with ROLM Corp. was signed last week following several months of final negotiations.

The basic firm-fixed price contract includes installation of a 13-node CBX II 9000 system utilizing a cable distribution system, digital telephones and other desktop devices.

Exactly how the telephone system will work — its features and operational procedures — will be the subject of a series of articles in the *Roundup* in the next several months.

Facility modifications began as soon as the contract was signed. Cabling will begin to be pulled into buildings on site in the next six to nine months, said Clyde Waters, the NASA contract monitor for the new system. In 10 months, employees will begin to see the new phones in their offices, and in 13 months, the system will be operational.

"The only way to make this changeover work is to do a flash cut," Waters said. "Employees will leave on a Friday with the old phone system operational, and will return on Monday to find a completely operational new system. We will need to begin putting the new phones in their offices about 60 days or so before the changeover, and it will take another 60 days or so after the switch to get the old phones out."

The ROLM system, which also will be installed in NASA facilities at Ellington Field, will provide more than 10,000 voice/data ports.

ROLM is a wholly owned subsidiary of IBM Corp.

## A day at the Olympics



Hundreds of employees and their families from the six divisions of the Mission Operations Directorate gathered Sept. 7 for the first annual MOD Olympics at the Gilruth Center. Events included favorites such as the tug of war, tricycle races, volleyball and the watermelon pass. MOD Director Gene Kranz, who dislocated a shoulder in the sack race, made it back from the clinic in time to share in one of the other favorites at the event.



## Sessions to cover contract management

A variety of top speakers will be on hand when the Space City-Houston Chapter of the National Contract Management Association (NCMA) hosts the Fall Regional Educational Conference Oct. 10 and 11 at the Hobby Hilton.

Featured speakers will include JSC Deputy Director Richard Goetz, Kennedy Space Center Deputy Director Thomas Utsman and JSC Director of Center Support William R. Kelly.

The opening session, "Indirect Cost Issues," will be preceded by

welcoming remarks from Kelly and will be moderated by James L. Neal, National President of the NCMA and JSC Procurement Officer. Speakers at the session will be Fred J. Newton, Deputy Director of the Defense Contract Audit Agency; Gordon Clarke, Legal Counsel to the Space Systems Division of the General Electric Co.; and Frank Rapoport, Northeast Regional Vice President of the NCMA and a partner in the Philadelphia law firm of Saul, Ewing, Remick & Saul.

The afternoon session Oct. 10,

"The Current Procurement Climate," will be moderated by Emyre Robinson, President of Barrios Technology, Inc. Speakers will be Joel R. Feidelman of the Washington, D.C. law firm of Fried, Frank, Harris, Shriver & Jacobson; Stanley E. Wilker, NCMA President-Elect and Divisional Manager of Contracts for TRW Inc. Space & Technology Group; and Stuart J. Evans, Assistant Administrator for Procurement, NASA Headquarters.

The speaker at the banquet that evening will be Hugh E. Witt, Vice President and Government Liaison

for United Technologies Corp.

The morning session Oct. 11, "Consolidation Plans, Issues and Expectations," will be chaired by Robert M. Ellis of Technology Incorporated. Featured speakers will be Goetz; Andrew J. Pickett, KSC Associate Deputy Director; Fred Haise, former astronaut and President of Grumman Technical Services Division; and Gordon K. Gilson, Deputy Director of Industrial Relations, NASA Headquarters.

The afternoon session, "Consolidation Experiences at Kennedy Space Center," will be moderated

by Robert L. Kline, a Houston government contracting and acquisition consultant. Speakers will be Utsman; E. Douglas Sargent, President of Lockheed Space Operations Co.; Robert G. Long, KSC Director of Center Support Operations; and James R. Dubay, President and General Manager, EG & G, Inc.

Interested employees are invited to attend the sessions. Civil Service employees should contact the Training Branch to register. Contractor employees should call Ralph Schimmel at 333-7236.

## Bulletin Board

### Commission to hold public forum

The Presidentially appointed National Commission on Space will hold a public forum in Houston Oct. 15. The forum will be comprised of two sessions — the first from 1:30 to 5 p.m. and the second from 6:30 to 9 p.m. The forum will be held at the Houston Museum of Natural Science, Brown Auditorium, at One Hermann Circle Drive. The purpose of the forum is to solicit opinions from the general public, industry and academia concerning long-range goals for the U.S. civilian space program to the year 2035. Commissioners Dr. Kathryn D. Sullivan and Dr. David Webb will be on hand to take testimony from interested persons. Those wishing to testify before the Commission should file a statement of intent by Oct. 8. The statement should briefly outline the nature of the testimony and should give the name, address, telephone number and, if applicable, the group represented by the speaker. The statement should be mailed to the National Commission on Space; ATTN: Public Forums/Houston, TX, 490 L'Enfant Plaza East, S.W., Suite 3212; Washington, D.C. 20024.

### First call for papers issued

The first call for papers for the 17th Lunar and Planetary Science Conference has been issued. The conference will be held March 17 to 21 at JSC and at the Lunar and Planetary Institute (LPI). The conference is recognized as the leading international gathering for the presentation of new results in planetary science. Plans call for no more than three concurrent sessions, with nine half-days devoted to presentations of research papers in topical symposia and in problem-oriented sessions. Sessions of broad interest, including international sessions on Venus and Mars, are planned. A special session also is scheduled on Martian geomorphology as part of the NASA-sponsored LPI study project called MECA (Mars: The Evolution of its Climate and Atmosphere). For more information on the conference, call the LPI Projects Office at 486-2150, or the LPI Publications Office at 486-2143 for information on publication of the abstracts and the Proceedings.

### NCMS to hold dinner meeting

The Texas Gulfcoast Chapter of the National Classification Management Society (NCMS) will hold a dinner meeting Oct. 15 at the Steak and Ale Restaurant at Baybrook Mall. The guest speaker will be a representative of the Federal Bureau of Investigation. NCMS is an organization for persons interested in topics related to the security field. Guests are invited. For more information or reservations, call Mort Haeder at 280-1500, x3356 before Oct. 9.

### EAA offering Muppet show discounts

The JSC Employee Activities Association is offering a \$4.50 discount on tickets to see the Muppet Show on tour at The Summit Oct. 12. The 90-minute show begins at 10 a.m. Tickets, regularly priced at \$9.50, will be on sale for \$5 after Sept. 30 at the Bldg. 11 Exchange Store.

### GSA vehicle sale is Oct. 11

The second General Services Administration vehicle sale, consisting of used 1979 to 1982 cars and trucks from the GSA fleet, will be held beginning at 9 a.m. Oct. 11 in the Banquet Room at the Gilruth Recreation Center. Some fifty vehicles will be on sale, including compacts, full size cars, vans and pickup trucks. An inspection of the vehicles will be held Oct. 8 to 10 from 10 a.m. to 2 p.m. each day at 2nd St. and Ave. B. All vehicles will be sold as is, and bids will be accepted only during the sale on the 11th. Buyers must arrange their own financing and cash or cashier's checks are required. All sales are final. The sale is open to JSC employees and to the public. For more information, call Milby, x3670.

### Symphony plans Oct. 13 concert

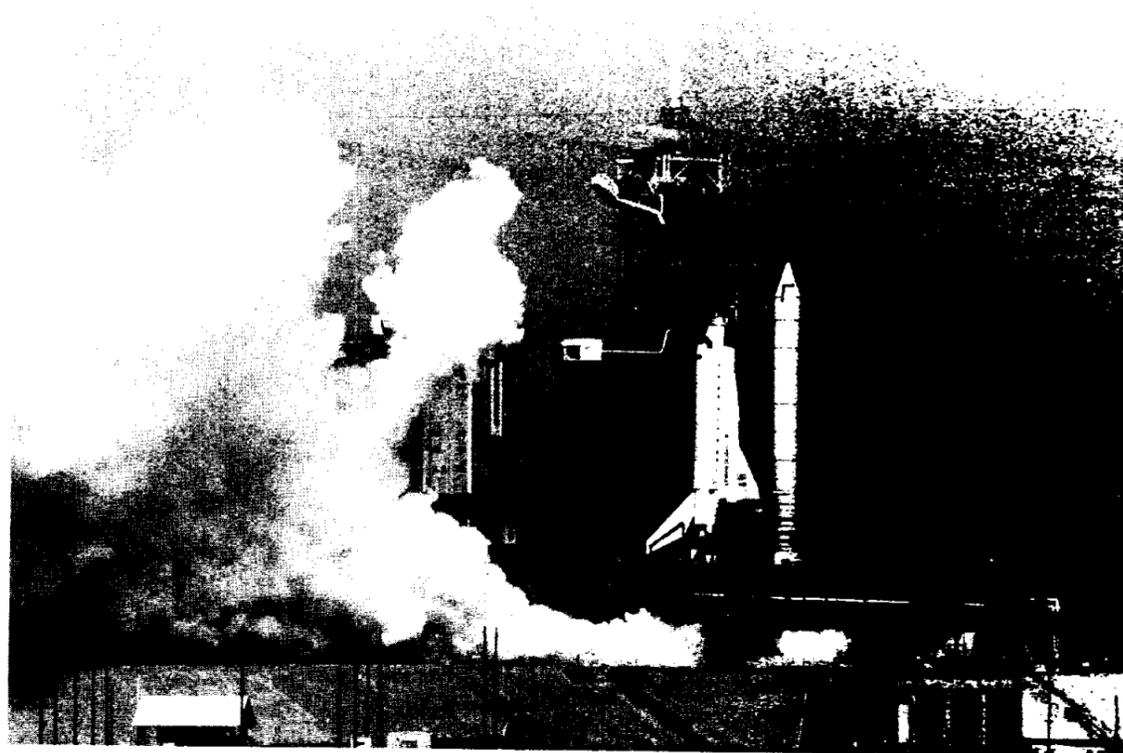
The Clear Lake Symphony will perform in concert at 8 p.m. Sunday, Oct. 13, in the auditorium at the University of Houston-Clear Lake. The performance will feature Sharon Robinson, an internationally renowned cellist, who debuted with the Houston Symphony at the age of 14. Since then, she has won acclaim from musicians and critics in this country and in Europe for her electrifying performances. All tickets for the concert are \$5. Season tickets are still on sale for \$20 for five concerts. The price is \$10 for senior citizens and students. Tickets may be purchased at the Needle Art Shop, 1936 El Dorado Blvd., the Clear Lake Area Chamber of Commerce on NASA Road 1, or at the ticket window at UH-CL. For more information, call 488-1754.

### NASA's Aerovan to visit JSC

The Aerovan, a large traveling exhibit designed to tell the story of NASA research in aeronautics, will be on display at JSC Nov. 1 to 3. The large walk-through trailer features nine exhibits that focus on current trends in aeronautical research, such as safety, energy efficiency and improvements in passenger comfort and convenience. Other exhibits address the future of aeronautical research and design. Aerovan lecturer William H. Gough will be on hand to answer questions.

### Major conference about Mars planned

A major conference on the history, science and future exploration of the Planet Mars will be held next year in Washington, DC. The three-day meeting will be held July 21 to 23 at the National Academy of Sciences. Persons interested in attending the conference should contact: The Mars Conference; Attn: Ms. Lu Agee; P.O. Box 416; Hampton, VA, 23669. The phone number is (804) 722-2595.



The main engines of the new Orbiter Atlantis roar to life in this view of the successful flight readiness firing.

### Leasat 4 declared lost

## Hughes chooses Shuttle for launches

Efforts to restore the UHF signal on Leasat 4, which was deployed Aug. 29 during STS 51-L, have been unsuccessful, Hughes Communications, Inc. announced last week.

The satellite builder also announced intentions to use the Space Shuttle to provide launch services for six satellites between 1987 and 1990.

Initial results of the Hughes investigation into the Leasat 4 problems point to the transmission cable between the UHF multiplexer and the transmit antenna as the most likely source for the failure. Measurements of the dynamic properties of the satellite indicate the UHF antennas are fully deploy-

ed and in their proper positions, and telemetry data indicate all UHF receivers and transmitters are functioning, Hughes said.

The UHF multiplexer, which filters and combines the signals from the UHF transmitters onto a single transmission cable, is not a likely source of the problem, Hughes said. Multiple failures in the unit would be required to cause a complete outage of the UHF system.

Hughes said the satellite does not have enough propellant aboard to permit lowering its orbit for a salvage attempt by the Space Shuttle. Leasat 5, the ground spare, will be launched to complete the Leasat system for the U.S. Navy.

The upcoming launches for which Hughes chose the Shuttle will comprise two satellites for the Japan Communications Satellite Co. and another four for future customers. All of the satellites are from Hughes' next generation, the HS-393 class.

The HS-393 is a high powered Ku-band satellite. Steven Dorfman, President and Chief Executive Officer of Hughes Communications, said the launch procurement represents a commitment of approximately \$180 million. "The decision to use the Shuttle for our next generation of satellites is of great significance," he said. "We judge that the Shuttle will provide low cost and reliable launches."

## Giacobini-Zinner will spawn meteor shower

The next object to pass through the wake of Comet Giacobini-Zinner will be the Earth itself, following by one month the path taken by NASA's International Cometary Explorer (ICE) during history's first encounter with a comet.

During the evening hours of Oct. 9, Earth will pass through a place in the Solar System where the comet was only 29 days before, making for what could be one of the most spectacular meteor showers in recent years, according to Deborah Byrd of the McDonald Observatory.

Bits of debris left behind by Giacobini-Zinner will enter Earth's

atmosphere during the Giacobinid (pronounced ja-KO-bin-id) meteor shower, perhaps producing as many as several thousand streaks of light in the night sky from the vaporization of cometary dust. The intensity of the meteor shower is dependent on the amount of material left behind by the comet, and although the ICE encounter showed Giacobini-Zinner to be relatively less dusty than anticipated, past showers have been heavy.

In 1933, some 6,000 meteors per hour were recorded. In 1946, when Giacobini-Zinner had passed only 15 days earlier, some 10,000 meteors per hour were seen despite a full Moon.

"Most meteor showers are named for the point in the sky from which they appear to radiate," Byrd said. "This shower, which occurs each year but generally is very weak, is sometimes called the Draconids, since it appears to radiate from the constellation Draco. But it is also called the Giacobinids, because the meteors are known to swarm close to the comet itself."

The month of October also will offer skywatchers a second meteor shower, the Orionid, spawned by Comet Halley. The peak will occur in the late afternoon hours of Oct. 20 for viewers in the United States.

## Commercial centers named

NASA has announced the teams selected to establish Centers for the Commercial Development of Space.

The five Centers are joint undertakings of government, industry and academic teams which will work closely with NASA field centers. The Centers are:

- Battelle Columbus Laboratories, Columbus, Ohio  
Dr. Frank J. Jelinek, Director  
Research Area: Multiphase Materials Processing
- University of Alabama, Birmingham, Ala.  
Dr. Charles E. Bugg, Director  
Research Area: Macromolecular Crystallography in Space
- University of Alabama, Huntsville, Ala.  
Dr. Charles A. Lundquist, Director

Research Area: Materials Processing

- Institute for Technology Development  
National Space Technology Laboratories  
Hancock County, Miss.  
Dr. Stanley A. Morain, Director  
Research Area: Space Remote Sensing
- Vanderbilt University  
Nashville, Tenn.  
Dr. Robert J. Bayuzick, Director  
Research Area: Metallurgical Processing in Space

In naming the teams, Issac T. Gillam IV, Assistant Administrator for Commercial Programs, said, "The objective of these Centers will be to stimulate high technology research taking advantage of the characteristics of space. This research will eventually lead to the development of new products which either have commercial potential

or contribute to possible new commercial ventures."

The five teams were selected from 21 proposals submitted to NASA based on:

- New and unique research leading to commercial activity requiring the space environment.
- Management teams that are capable of selecting and directing research projects that are commercially oriented
- Available non-NASA resources to help operate the Center, including the commitment of industrial resources.

NASA will initially fund the Centers for a period not to exceed five years at which time they are expected to be self-sustaining.

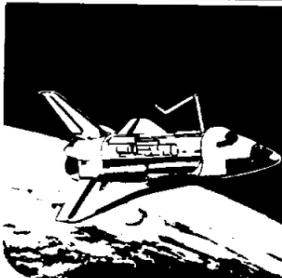
Funding for each Center will range from \$750,000 to \$1.1 million on a year to year basis.

NASA  
Lyndon B. Johnson Space Center

## Space News Roundup

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Editor ..... Brian Welch



# Teachers report for duty, begin training

Surrounded by lights, cameras and reporters, Christa McAuliffe, the first selectee for the Space Flight Participant Program, and backup Barbara R. Morgan arrived at JSC Sept. 9 to begin their training program. McAuliffe will be the first teacher, as well as private citizen, to fly onboard the Shuttle. She is scheduled for flight on STS 51-L in January.

McAuliffe and Morgan, selected from more than 10,000 teacher applicants, were accompanied by reporters, photographers, and television crews as they arrived at Bldg. 100 for badging. Smiling and responding to media queries, McAuliffe said she was "really excited and anxious to begin training."

Mission Commander Francis R. "Dick" Scobee welcomed McAuliffe and Morgan that afternoon at a meeting with the 51-L crew. Other crew members assigned to 51-L are Pilot Michael J. Smith and Mission Specialists Ronald E. McNair, Ellison S. Onizuka and Judith A. Resnik. After the meeting, McAuliffe said she is looking

forward to getting better acquainted with the crew and to mission-specific training as one of the team.

On the second day, measurements for flight suits, helmets, and G-suits were made. Of the NASA-supplied clothing, McAuliffe said she will be allowed to choose either a jumpsuit or a standard flight suit to take home with her after her historic flight.

Seemingly unselfconscious during a food tasting and rating session in Bldg. 37, both teachers commented on their surprise in finding space food so flavorful. McAuliffe and Morgan were asked to taste about 40 food and drink items and rate them on a scale of 1-9 as news media were allowed to observe, record, and report on their sampling. At the end of the session, Dr. Charles Bourland, manager of the food lab, said they would have several more opportunities for taste tests before McAuliffe must decide on her flight menu.

Other first-week activities included orientation briefings by manage-



McAuliffe and Morgan sample standard Shuttle fare in the JSC food lab. Looking on is Dr. Charles Bourland, food lab manager.

ment and training officials and familiarization tours of training facilities and Mission Control.

Asked by a reporter how drastically her life has changed since her selection, McAuliffe said that

other than having the opportunity to fly onboard the Shuttle and the accompanying publicity she doesn't perceive that much difference. She said she has been a teacher for a long time and in that

capacity she has gathered material and presented information almost daily to students. "As I see it, I'm doing basically the same things, only my audience has changed."

— Barbara Schwartz

## Columbia to become research platform

The venerable Orbiter *Columbia*, the ship used to gather data on spaceflight conditions through the Developmental Flight Instrumentation Program, will now become a research platform for aerodynamic studies when she next takes to space in December.

Three aerodynamic research experiments were added to *Columbia* during her recent overhaul at Rockwell International's Palmdale, Calif. plant, experiments which will provide details never before available about hypersonic flight.

Researchers will use this flight data to develop designs for the second generation space shuttle and other future space transportation systems.

The most obvious change in *Columbia*'s appearance is a cylindrical housing which replaced the fin tip of the vertical tail. The new experiment pod is approximately 20 inches in diameter and is capped at the leading edge by a spherical dome. The pod contains equipment for the Shuttle Infrared Leaside Temperature Sensing experiment, known as SILTS.

SILTS will obtain high-resolution, infrared images of the upper (leaside) surfaces of *Columbia*'s port wing and fuselage as the Orbiter reenters Earth's atmosphere. The infrared images will provide detailed temperature maps at the surface of the leaside thermal protection materials. The maps will indicate the amount of aerodynamic heating of the surfaces in flight, acquiring data that

cannot be adequately simulated in ground tests.

SILTS images will be obtained by an infrared camera, mounted inside the dome, that will view *Columbia*'s left wing and fuselage through two windows. The windows will be protected from debris during launch by plugs that fill the window cavities. The plugs will be ejected when the experiment begins, and the windows will be actively cooled during reentry by the injection of gaseous nitrogen into the cavities. Experiment data will be stored on a tape recorder.

The experiment will be initiated by *Columbia*'s computer at the time of entry interface, about 400,000 feet above Earth. It will end after the Orbiter passes through the period of significant aerodynamic heating.

A less obvious change to *Columbia* is a completely new nosecone to house the Shuttle Entry Air Data System (SEADS) experiment. The nosecone has 14 penetration assemblies distributed about its surface, each containing a small hole through which local surface air pressure will be measured during reentry.

Measurement of the distribution of air pressure about the nosecone will allow precise post-flight determination of the Orbiter's attitude relative to the oncoming airstream and the density of the atmosphere through which the vehicle has flown.

Accurate knowledge of these factors, coupled with vehicle

motion information measured by a separate experiment, are required to determine Orbiter aerodynamic flight characteristics. The lack of accurate air data has prevented scientists from determining exact Orbiter inflight aerodynamic characteristics. SEADS will provide accurate data from an altitude of about 56 miles through landing.

A third experiment, not visible from outside the Orbiter, is inside the nose wheel well. The Shuttle Upper Atmosphere Mass Spectrometer (SUMS) will complement the SEADS experiment by providing atmospheric density information at altitudes above 50 miles.

SUMS will sample air at *Columbia*'s surface through a small hole, located just aft of the nosecap, to measure the number of molecules of various gas species. The information will be used to determine the atmospheric density that, with vehicle motion information, will allow determination of Orbiter aerodynamic characteristics at altitudes where the atmosphere is extremely thin. Aerodynamic flight at these altitudes cannot be simulated in ground tests.

The SUMS instrument is a mass spectrometer originally developed for the Viking spacecraft that landed on Mars in 1976. It has been modified to operate in the reentry flight environment of the Orbiter.

The experiments were developed at the Langley Research Center as part of the Orbiter Experiments Program, managed by NASA's Office of Aeronautics and Space Technology.

## Microgravity lab opens at Lewis

A new laboratory designed to help make better decisions on Earth about what is and is not feasible for science experiments in space has been opened at the Lewis Research Center.

The Microgravity Materials Science Laboratory (MMSL), supported by the Microgravity Science and Applications Division, Office of Space Science and Applications at NASA Headquarters, offers a low-cost, low-risk way for U.S. scientists and engineers to test new ideas for materials science research in space before starting formal efforts in their own laboratories.

"The MMSL has been designed to provide easy access for U.S. researchers, from government, universities and industry, to conduct scientific experiments using equipment that functionally duplicates what is on the Space Shuttle," said Salvatore J. Grisaffe, Chief of the Lewis Materials Division, which will

manage the new facility. "Access to such a laboratory will give U.S. companies a competitive advantage in developing better materials through microgravity research."

A functional duplicate may be anything from a reproduction of only the portion of the Space Shuttle equipment in which the actual materials experiment resides (such as the furnace system) to an exact copy of the flight hardware. MMSL functional duplicates will, of course, operate in the Earth's gravity (one-g).

The MMSL is one part of NASA's Microgravity Science and Applications Program, which fosters research in the science and technology of processing materials in low gravity. The aims of the program are to obtain a clearer understanding of the factors controlling Earth-based processes in order to guide their improvement; the development of new materials that cannot now

be made on Earth; and the evolution of procedures to support long-term space operations.

In the MMSL, a researcher can establish a scientific baseline toward determining the specific role of gravity in a particular experiment. By conducting carefully planned scientific experiments in a one-g environment on Earth, scientific research will be more precisely defined before moving toward the more costly phase of experimental work in space.

Initially, the MMSL will be dealing with experiments involving metals, alloys, and electronic crystals. Laboratory capabilities will be expanded in the future by support from NASA's Commercial Use of Space Program into the areas of ceramics, glasses, and polymers. Applications to use the Lewis MMSL will be submitted in the form of brief proposals from interested investigators.

## Gilruth Center News

Call x3594 for more information

**Aerobics** — A specialized program to develop total fitness, this class will consist of stretching and limbering exercises followed by a vigorous workout. The class meets Tuesdays, Wednesdays and Thursdays from 4:45 to 5:15 p.m. for 8 weeks beginning Oct. 1. The cost is \$30 per person.

**Word processing** — The production of such documents as legal letters and resumes, using Wordstar, will be covered in this course, which meets from 5:30 to 8:30 p.m. beginning Oct. 21. The duration is 6 weeks and the cost is \$190 per person.

**Defensive driving** — Learn how to drive safely and qualify for a 10 percent reduction in your auto insurance rates for the next 3 years. This class will be held from 8 a.m. to 5 p.m. Oct. 5. The cost is \$20 per person.

**Exercise class** — Come stretch with the gang in this class which meets Mondays and Wednesdays in October from 5:15 to 6:15 p.m. The cost is \$12 per person.

## Cookin' in the Cafeteria

### Week of September 30 — October 4, 1985

**Monday** — Cream of Chicken Soup; Beef Burgundy over Noodles, Fried Chicken, BBQ Sausage Link, Hamburger Steak (Special); Buttered Corn, Carrots, Green Beans. Standard Daily Items: Roast Beef, Baked Ham, Fried Chicken, Fried Fish, Chopped Sirloin. Selection of Salads, Sandwiches and Pies.

**Tuesday** — Beef Noodle Soup; Baked Meatloaf, Liver & Onions, BBQ Spare Ribs, Turkey & Dressing (Special); Spanish Rice, Broccoli, Buttered Squash.

**Wednesday** — Seafood Gumbo; Broiled Fish, Tamales w/Chili, Spanish Macaroni (Special); Ranch Beans, Beets, Parsley Potatoes.

**Thursday** — Navy Bean Soup; Beef Pot Roast, Shrimp Chop Suey, Pork Chops, Chicken Fried Steak (Special); Carrots, Cabbage, Green Beans.

**Friday** — Seafood Gumbo; Broiled Halibut, Fried Shrimp, Baked Ham, Tuna & Noodle Casserole (Special); Corn, Turnip Greens, Stewed Tomatoes.

### Week of October 7 — 11, 1985

**Monday** — Chicken Noodle Soup; Wieners & Beans, Round Steak w/Hash Browns, Meatballs & Spaghetti (Special); Okra & Tomatoes, Carrots, Whipped Potatoes. Standard Daily Items: Roast Beef, Baked Ham, Fried Chicken, Fried Fish, Chopped Sirloin. Selection of Salads, Sandwiches and Pies.

**Tuesday** — Beef and Barley Soup; Beef Stew, Shrimp Creole, Fried Chicken (Special); Stewed Tomatoes, Mixed Vegetables, Broccoli.

**Wednesday** — Seafood Gumbo; Fried Perch, New England Dinner, Swiss Steak (Special); Italian Green Beans, Cabbage, Carrots.

**Thursday** — Cream of Chicken Soup; Turkey & Dressing, Enchiladas w/Chili, Wieners & Macaroni, Stuffed Bell Pepper (Special); Zucchini Squash, English Peas, Rice.

**Friday** — Seafood Gumbo; Baked Flounder, 1/4 Broiled Chicken w/Peach Half, Salisbury Steak (Special); Cauliflower au Gratin, Mixed Vegetables, Buttered Cabbage, Whipped Potatoes.

### Week of October 14 — 18, 1985

**Monday** — Columbus Day Holiday.

**Tuesday** — Tomato Soup; Potato Baked Chicken, BBQ Spare Ribs, Mexican Dinner (Special); Squash, Broccoli, Ranch Beans, Spanish Rice.

**Wednesday** — Seafood Gumbo; Liver & Onions, Baked Turbot, BBQ Ham Steak, Baked Meatloaf w/Creole Sauce (Special); Beets, Brussels Sprouts, Green Beans, Whipped Potatoes.

**Thursday** — Beef & Barley Soup; Chicken & Dumplings, Corned Beef w/Cabbage, Smothered Steak w/Cornbread Dressing (Special); Spinach, Cabbage, Cauliflower au Gratin, Parsley Potatoes.

**Friday** — Seafood Gumbo; Pork Chop w/Yam Rosette, Creole Baked Cod, Tuna & Salmon Croquette (Special); Brussels Sprouts, Green Beans, Buttered Corn, Whipped Potatoes.

AT BUILDING #3

On Wednesday we feature The Reuben: Corned Brisket, Swiss Cheese on a bed of Sauerkraut, Poupon Mustard on Rye and 1/4 Pickle. Delicious! Monday and Thursday check out our French Dip Sandwich.

# Roundup Swap Shop

All Swap Shop ads must be submitted on a JSC Form 1452. The forms may be obtained from the Forms Office. Deadline for submitting ads is 5 p.m. the first Wednesday after the date of publication. Send ads to Roundup, AP3, or deliver them to the Newsroom, Bldg. 2 Annex, Room 147. No phone in ads will be taken.

## Property & Rentals

Rent: New Orleans condo, penthouse, French Qtr., Oct. 11-18. Faye. 280-3695 or 480-5656.

Sale: Brazoria Cty. lakefront lot, 12% assumable, near fishing, swimming, etc. Don. 280-6307 or 554-6205.

Sale: One half house ownership, \$300/mo., no down, 2 to 1 tax advantage. Randall, x2381.

Sale/lease: Friendswood/Sun Meadow 4-2-2, 2 story, 2,125 sq. ft., FPL, large corner lot, 650/mo. or \$65,000 assumable. Keith, x5202 or 485-3618.

Sale: Heritage Park 3-2-2, FPL, fans, deck & spa, near school, pool & tennis, FHA assumable, \$5,000 equity, 996-9411.

Sale: Large waterfront lot, near marina, 105 ft. frontage, trees, fishing. (409) 855-2063.

Lease: League City 3-2-1, W/D, new paint, refrig., fenced, near pool, \$490/mo. Bob, 280-3494 or 554-2250.

Sale: 2-2-5-1 townhome, 2 mi. from JSC, leased thru June by excel. tenant, \$7,500 equity, 11.5% FHA fixed assumable, no approval. 333-2636.

Sale: 3-2-5-1 townhome, near JSC, \$8,000 equity, 11.5% assumable FHA fixed, no approval, excel. cond. 333-2636.

Lease: SW Houston 1-1 condo, FPL, W/D, covered parking, \$350/mo., one mo. free carpool to JSC w/rental. Tom, x3821.

Sale: Countryside North 3-2-5-2, 2 story, \$55,850. Ted, x7484 or 554-7234.

Lease: El Dorado Way 2-2 condo, up, split BR, facing pool, refrig., W/D, \$450/mo., Lo, 333-1251 or 488-4052.

Sale/lease: League City 3-2-5 condo, all appliances, garage, jacuzzi, lawn maintenance. Lazarow, 280-4313 or 554-6378.

Sale: Horseshoe Lake Estates 3-1 cedar house on stilts, A/C, fully furnished, 1 acre, on small fishing lake, near Trinity River. Susan, x3138 or 479-5594.

Lease: Sycamore Valley/EAFB 3-2-2, FPL, formal dining, fenced, lge. kitchen, new paint & carpet, \$575/mo. 482-6609.

Rent: Garage apartment, near NASA, on lake, 2 rooms & bath, furnished, sep. entrance, off street parking, pool, \$300/mo. bills paid. 532-1643.

Sale/lease: Bal Harbour townhouse, 4-3-2, 38' boat slip, flexible terms, \$218K or \$2,000/mo. 488-8415.

Rent: Pebblebrook condo, 2-1.5, all appliances, fans, FPL, 2 balconies, pool, tennis, near NASA. \$400/mo. Angie, x2055.

Sale: Time share condo, The Landing at Lake Conroe, 2 BR, one week/yr., \$7,000 or \$2,000 equity and assume. Dan, x7484 or 480-0687.

Lease: Friendswood 3-2-1, brick, fans, fenced, covered patio, nice. \$450/mo. 472-3244 or 326-4481.

Lease: CLC area 3-2-5-2, FPL, 2 story, big yard, gas grill. 472-3244 or 326-4481.

Sale: League City 3-2-2, FPL, cathedral ceiling, garage w/ workshop, redone in and out, custom built, new roof, \$69,900. 996-8471.

Rent: El Dorado Trace 2-2 condo, W/D, FPL, covered patio & parking, frost free refrig. \$425/mo. 480-2766.

Rent: 1985 condo timeshare week, select place & time from RCI directory, 4 people/\$500. Mac, x2013 or 488-3976.

Sale: Countryside 3-2-2, 5 yrs. old, excel. cond., assume 12.5% FHA, no qualifying, closing costs or points. 332-4981.

Rent: Lake Tahoe 2 BR condo, most dates available, 1 week, Sat. to Sat., 6 persons max. \$700/wk. 482-5154.

Sale: LaPorte 2-1.5 townhome, double covered parking, fenced patio, shed, new carpet, immaculate. \$39,500. 471-3425.

Sale: Pipers Meadow 3-2-2, low down, no points, no closing costs, some owner finance, assume FHA 13%. Steve, x4575 or 482-1445.

Lease: Baywind II condo, 2-2.5-2, large 2-story, FPL, W/D, fans, \$480/mo. Jeff, x5595 or 280-8608.

Lease: Sterling Knoll 4-2-2, heated spa, fenced, low utilities, 12 min. to NASA, Webster schools, \$700/mo. 280-0549.

Sale: 3-2-2 brick, on 1 acre, FM 517, between Dickinson & Alvin, Santa Fe schools, many extras, \$71,500. 337-2680.

Lease: Baywind 1 BR efficiency, completely furnished. Dan, 333-3925.

Sale: Double lot at Hilltop Lakes Resort, \$4,500. 554-6201.

Lease: Shaver/Edgebrook area 3-1.5-2, brick, central heat/AC, carpet, drapes, appliances, clean lovely home in excel. location. \$465/mo. 941-5908.

Sale/trade: Sagemont Park 3-2-5 townhouse, 2 story, 2,000 sq. ft., garage, covered deck, formals, 5 walk-ins, \$85K or trade for patio home of equal value. Lott, x2271 or 484-1326.

Sale: 2 lots near Crosby & Lake Houston, 9,375 sq. ft. for \$6,800, 8,400 sq. ft. for \$5,700, both for \$12,000.

Sale: Alvin 3BR, den, study, FPL, large lot, dbl. garage, good location, quiet, assume 9% non-esc. Kay, x5222 or 585-3570.

Sale: Nassau Bay 4-2-2, 2,200 sq. ft., master down, \$114,900, owner financing until your house sells. Jerry, x3561 or 474-4310.

Lease: Countryside/League City 3-2-2, FPL, fans, \$500/mo. 554-2065.

Lease: League City 3-2-1, W/D, refrig., fenced, near pool, \$475/mo. Bob, 280-3494 or 554-2250.

Sale: Gulfgate/Park Place 4-2-1A, den, central air/heat, 1,560 sq. ft., storage, detached workshop, \$52,000. By appointment. Leona, x3338 or 643-4456.

Lease: Seabrook Baybrook subd., 3-2-2, brick, microwave, fenced, FPL, avail. Oct. 1, \$575/mo. plus deposit. 326-1944.

## Cars & Trucks

'75 Datsun B-210, auto, AC, good tires, recent tuneup, needs engine work, \$1,200. Marianne, 554-5818.

'82 Chevy S-10 Tahoe, long bed, V6, 4 spd., cruise, AC, PS, PB, AM/FM/cassette, new tires, \$5,500. 482-1535.

'81 Datsun 310 GX w/sunroof, 35 MPG, \$3,500, Al, x5016 or Debra, x4471, or 554-6643.

'79 Chevy Beauville van, V8, PS, PB, AM/FM, dual AC, 12-pass., cruise, auto, \$4,200. Edmiston, x6316 or 991-0729.

'63 Falcon Ranchero, 6 cyl., good engine, all original, very good condition. Beatty, x2673 or 482-7938.

'78 Porsche 924, auto, sunroof, 42K mi., AC, AM/FM/cassette, excel. cond. 482-7643.

'81 Mustang, 4 cyl., auto, PS, PB, AC, AM/FM, excel. cond., \$3,350. 474-3507.

'81 Buick Skylark, 2 dr., AC, AM/FM/cassette, new transmission, \$3,500. Koop, x6156 or 486-1923.

'80 Trans Am turbo, needs engine work, T-tops, AC, stereo, etc., \$2,000. 554-6093.

'80 Chevette, good cond., AC, AM/FM, 32K mi., \$2,100. 488-0842.

'77 Ford LTD II, 4 dr., PS, PB, AM/FM/cassette, good work car, \$800. 471-4843 or 488-2500.

'79 Chevy Camaro Berlinetta, \$2,600. Al, x3803.

'81 Datsun 280ZX, T-tops, 50K mi., 5 spd., AC, luxury package, good cond., \$7,900. 532-3415.

'84 Chevy Caprice Classic, V8, 4 dr., AC, PS, FM, tilt, cruise, low miles, \$7,500. 474-4808.

'77 Ford Granada, 2 dr., V8, auto, PS, PB, AC, good student car, \$950. Tom, x4084 or 534-4142.

'78 Olds Delta 88, 4 dr., PS, PB, AC, Pioneer stereo, new paint & windshield, engine excellent, \$1,800. 332-0510.

'78 Toyota Corolla, new paint, JVC sound, showroom condition, \$3,000 OBO. Jeff, x5841.

'75 GMC pickup, 350, auto, AC, PS, AM/FM/cassette, chrome tube grill, tinted headlight covers, very good cond., \$2,500 OBO. Bryan, 480-1308 or 944-3725.

'76 Lincoln town car, all the extras, \$2,200. 333-5482.

'76 Dodge Monaco, 4 dr., V8, good work car, \$1,095. Heitmann, x5341 or 480-8223.

'81 Rabbit diesel, LS Sports, 4 spd. 4 drive, sunroof, Kenwood sound, 40MPG, one owner, sacrifice at \$2,400 OBO. Nancy, x4086 or 333-5204.

'81 Chevy Silverado 1/2 ton pickup, SWB, auto, AC, PS, PB, tilt, cruise, aux. tanks, AM/FM/cassette, \$4,800. 455-4864.

'78 Mercedes 450 SE, sunroof, AM/FM/cassette, power windows & locks, excel. cond., \$14,500. 996-9520.

'81 Pontiac Firebird, V6, AT, PS, PB, AC, tilt, AM/FM/cassette, very nice, \$4,200. McNeely, x6347 or 482-5837.

'82 Ford Escort SW, power, AM/FM/cassette, AC, 60K mi., A1 cond., \$3,600. 326-2339.

'70 VW square back, collector's item, runs great, needs fender/hood, \$650. 326-2339.

VW body, partially bajaed, w/engine, \$100 OBO. Calvin, 388-1290.

'76 Blazer, 4WD, 350 V8, AT, AC, PS, AM/FM/cassette, Cheyenne pkg., \$3,500. 333-2218.

'80 Fiat X1/9, 5-spd., AM/FM/cassette, 30K mi., good cond., \$4,000. Farmer, x6101 or 532-3173.

'78 Alfa Romeo Spyder, 5-spd., AM/FM/cassette, sheepskins, 50K mi., good cond., \$4,000. Farmer, x6101 or 532-3173.

'79 VW Rabbit, 2-dr., 4-spd., AC, AM/FM/Cassette, ex. cond., \$2,000. Jerry, x4461 or 333-9370.

'84 Trans Am, 5-spd., 17K mi., ext. warranty, excel. cond., must sell, \$9,500. Kent, x4208 or 484-2411.

'77 Olds Vista Cruiser SW, auto, AC, AM/FM, PB, PS, rack, rear defog., 3

seats, 57K mi., excel. cond., \$1,800. Gloria, x3810 or 486-1865.

'66 Chevy pickup, auto, 6-cyl., long bed, 26K mi., rebuilt engine, \$975 cash. Busby, 488-2500.

'77 Chrysler Cordoba, PS, PB, AM/FM, runs well, \$895. Don, 480-4718.

'76 Mercury marquis, one owner, 34K mi., new tires, excel. cond., \$1,995. Smith, x6461 or 941-0575.

'81 Ford F-150 pickup, 1/2 ton, cold AC, auto, V-8, longbed, 2 tanks, 1 owner, \$3,295. 280-0454.

'73 Ford Torino SW, auto, PS, PB, AC, radio, good condition, reliable, \$1,000. 482-2527.

## Boats & Planes

'81 Tidecraft bass boat, 80HP Merc., pwr. tilt & trim, aerated live wells, depth finder, etc., \$4,450. Don, 280-6307 or 554-6205.

Rent: IFR Piper Warrior PA-28-161, \$38/hr. wet, based at Houston Gulf, instructor avail. 946-1750.

'77 Bayliner runabout, 17', 200HP Volvo outdrive, galv. tandem trailer, \$3,850. 554-6201.

Sale or trade: Sail shark 13' sailboat and trailer, a steal at \$575. McGee, 488-3720 or 334-4361.

Sale: Tri-hull deck boat, Four Winns '84 Candia, 190 Brougham, 140 Merc I/O, 20 hrs. on motor, tandem trailer. 537-0672 after 5 p.m.

15 ft. Lamar fishing/ski boat, 50HP Evinrude, electric shift, trailer, skis, \$1,650. 488-4463.

## Cycles

'72 Honda CX500, not running, sell as is, has Wind Jammer, new battery & tires, \$450 OBO. 471-4843.

20" super mongoose bike, like new, all chrome, \$175. McNeely, x6347 or 482-5837.

'80 Suzuki 850 GSL, luggage rack, Fairing, like new, 488-8919.

'84 Honda 650 GL Silver Wing, touring package, new cond., 3,600 mi. Moser x6511 or 474-2060.

Boy's open road dirt bicycle, 20" wheels, \$40; Girl's Free Spirit 3-sp., 24" wheels, \$50; man's 3-sp., 26" wheels, \$45. Coan x5212 or 488-1028.

'80 Yamaha 650 Special II, under 10,000 mi., exc. cond., \$1,050 or trade for van or pickup. Eric x3458 or 532-2311.

'80 650 cc Yamaha Special, 9,000 mi., chrome Hooker Header tailpipe, luggage rack, helmet, service manual, new rear tire and spare parts. Justin 436-9379.

20" Super Mongoose bicycle, all chrome, like new, cost \$320, asking \$180. McNeely x6347, or 482-5837.

Schwinn 3 sp. bicycle, many extras, new \$300, now \$150, 482-8262.

'75 Honda 750F Supersport MC, low mileage, ex. cond., Bullock, 326-4949.

24", 10 sp. boy's bike, needs tires, \$20, 488-4463.

Hondamatic, ex. cond., low mileage, best offer, 488-3354.

## Audiovisual & Computers

Zenith 26" color TV console, remote, 3 yrs. old, contemporary cabinet, great picture, a steal at \$200. Call Brian, x5111 or 480-5194.

IBM PC Jr., color monitor, 128K, 1 disk drive, IBM DOS 2.1 and Basic, \$750. Robert, x5595.

Dot matrix printer, C.I.TOH Prowriter 8510AP, parallel interface req'd, 120 CPS, 1 yr. old, \$230. Bill, x5495 or 991-0361.

Atari video game, like new, storage case, 20 cartridges, \$200 OBO. Ed, x5489 or 480-0273.

Franklin ACE 1000, 64K, 1 disk drive, color monitor, Apple II compatible, all manuals. Bob, x7261 or 280-0984.

PCjr with 128K, 1 disk, color monitor, BASIC cart., RS232 cable, keyboard cable. DOS 2.1. Steve, x7254 or 486-0627.

Sears color tv, \$100, good color picture; mini-portable tv, 5", b/w, ac/dc, \$150, 488-5564.

Bausch & Lomb Balomite 500 projector w/5 in. f/3.5 lens, remote control & 8 slide trays, \$100; radiant screen w/cover, 50" x 50", \$35, 941-5908.

Magnavox stereo console, very good sound, \$100, 488-2350.

## Household

Sears 17 cu. ft. upright freezer, frost free, copper-tone, good cond., \$125. 488-4487.

Antique pine wardrobe, refinished, \$250. Debra, x4471 or 554-6643.

Maple rocking chair, \$25; youth bed, \$45; couch & chair, \$100. 482-8827.

Spanish velvet sofa, 8", excel. cond., \$150; GE dryer, \$150. 332-0510

Large folding bed, \$18; day bed, \$45; foam cushion bed, \$18; antique maple bed, \$35. Claire, 474-4310.

Full size mattress and foundation, frame and headboard, \$20. Jerry, x4461 or 333-9370.

Queen-size Waterbed, frame, headboard, heater, mattress pad, \$100. Bob, x5293.

Couch w/2 matching chairs, tan/brown, good cond., 6 yrs. old, \$150; child's Century walker, \$8; Potty, \$4; Barbie townhouse w/furniture, \$10, 554-2665.

Antique oak gate-leg table w/ drawers & storage, 30" x 50", \$125; 9 x 12 braided oval rug, brown/multi, never used, \$60; kingsize headboard, rock maple, like new, \$100, 486-4113.

Early American queen size sofa bed & rocking chair, very sturdy, needs a little upholstery work, \$125, 334-4894.

Kingsize water bed, burnt-wood siding, \$100 OBO. Boyd x2051 or 846-1418.

Nice couch, upholstery perfect, deep turquoise color, makes into bed, \$70; white French single bed w/mattress, box springs & spread, \$50; tall, brown, wood bookcase, 80" x 30", \$65. Thompson, x2638.

Queen-size Sealy mattress, new, \$90, Vi x4596.

Single bed w/frame, mattress & box springs, \$75. Lonnie x2651.

Queensize bedroom set w/mattress, 2 night stands & 2 armoires, solid oak, \$1000, 332-1148.

Draperies, foam-backed, 72" x 61", burnt-orange, like new, \$10. Ed x5489 or 480-0273.

Couch & loveseat, brown & rust w/wood trimming, good cond., \$150. Sheryl x2881 or 333-9408.

52 gal. electric hot water heater, A.O. Smith Permagas I (top of the line), ex. cond., \$50. McNeely x6347, or 482-5837.

Continuous 30" gas range, 1 yr. old, new \$530 now \$300; electric clothes dryer, 1 yr. old, new \$320 now \$200, 482-8262.

Antique Singer sewing machine, \$150. Ed Boddy x6108 or 944-9340.

Cash & carry sofa, \$40, good cond., 554-7706.

Freezer, Sears 9.0 cu. ft., apart. size, \$75; sofa, large, black naugahyde w/gold trim, b/o; sofa, large w/flower design, \$75. Kaye x5222 or 585-3570.

Roommate to share 4 BR house, w/pool, \$350/mo. plus util. 280-4169 or 538-2914.

Want front and rear doors for left side of 77 Skylark. 482-6609.

Want Commodore 64, disk drive, printer, word processing software. Mac, x2013 or 488-3976.

Want back issues of "Dragon" magazine. Koop, x6156 or 486-1923.

Want used refrigerator, not fussy about looks, must run well. Sue, x2051.

Roommate to share 3-2-2 in League City subdivision, microwave, F/P, male or female, \$200/mo. + 1/3 util. Call or leave message 554-7706.

Roommate for nice, large 2-2.5 townhouse, next to NASA, microwave, cable, W/D, private bath, \$250 + 1/2 util., 488-8919.

Rider to share drive/gas to Daytona, Florida during Thanksgiving weekend, Joey x6193 or 996-9162.

Roommate to share Friendswood house, \$170/mo. + 1/3 util., waterbed, w/d, microwave, cable, Joey x6193 or 996-9162.

Roommate wanted to share house, non-smoker, 2 mi. from NASA, \$225 + 1/3 util., 474-7481.

Would like to trade rides or share ride from hwy 6 in Algoa to NASA, 7:30-4:00, Rita x6105.

Roommate wanted to share 3-2 house, 10 min. from NASA, non-smoker, \$215/mo. + util. Kristen x3803 or 996-7564.

Steel weights for barbell set, full sets not necessary. Steve x6128.

Used Kenmore washer, don't trash it, JP x4241 or 486-4113, need a good tub for old washer.

Roommate to share League City 3 br. house, \$210/mo., all bills paid, furnished, no smoking/pets/kids, full privileges. Ruth x3643 or 332-8251.

Used aluminum jon boat 12-14 ft., w/o w/o small outboard motor; small 5 hp. or less outboard motor, Tony Smith x4061.