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Truly outlines replanning effort

Stressing a conservative approach to assure flight safety, Rear Admiral Richard H. Truly, Associate Administrator for Space Flight, addressed all NASA employees March 25 and outlined the Agency's plans for recovery from the *Challenger* accident.

Speaking from the Johnson Space Center, Truly pledged a return to flight status as soon as possible, but within the guidelines of a comprehensive review and redesign plan. JSC Director Jesse W. Moore pledged that JSC would support Truly's efforts "Very vigorously over the next months."

Truly said his address was meant to convey the message that NASA's future course is now in the hands of the thousands whose work will make the recovery plan possible. "It is they who must understand it and they who must do it," he said.

He stressed that a preliminary manifest assessment, which lists a first flight on Feb. 5, 1987, was produced for budgetary and planning purposes only. The manifest assumes a down time of one year, followed by a three year plan of 9 flights the first year, 14 flights the second and 18 flights the third year. "Those numbers are for budgetary and planning purposes only. The plan does not direct the first launch date or the number of flights," he said.

Truly's plan stresses flight safety. It calls for a redesign of the solid rocket booster field joints, as well as qualification tests and full scale motor firing tests; destacking of the STS 61-G SRBs for inspection; a complete Shuttle system design reverification; a complete design review of the Criticality 1 and Criticality 1R items, as well as Crit 2 and Crit 3 items; a review of inspection requirements; a reassessment of launch abort and abort mode plans; and a review of launch site weather forecasting capabilities.

"When we are done with that," Truly said, "We will be ready to fly."

Truly reminded employees that conservatism was important but not an absolute guarantee of safety. "The business of spaceflight cannot be risk free," he said, "but a conservative approach will make it close to that. This won't be a namby pamby program. It's a bold business. You cannot print enough money to make it totally risk free."

In a press conference following his address, Truly said NASA would "make clear to all our customers that we are getting back in the business," and added that he believes the Shuttle will have "no problem" being competitive in the world launch market.

Truly said, "NASA must regain its credibility. We must emphasize flight safety and conservative flying, but over the next few years, we will get back into robust Space Shuttle flying.

(Continued on page 2)

NASA managers met with the press last week at JSC during release of a plan for recovery from the 51-L accident. Left to right are, Robert L. Crippen, Deputy Director of Flight Crew Operations; Thomas L. Moser, Deputy Associate Administrator for Space Flight; Rear Admiral Richard H. Truly, Associate Administrator for Space Flight; and JSC Director Jesse W. Moore.

Canada, Japan sign Station agreements

NASA concluded agreements last week with two international partners for continued Phase B work on the Space Station.

The agreements, with the governments of Japan and Canada, will cover the remainder of the Station Phase B effort.

The agreement with Canada's Ministry of State for Science and Technology cover preliminary design of a Mobile Servicing Center for the Station, building on Canada's expertise with remote manipulator system technology. Canada designed and developed the Shuttle robot arm system.

Canadian Prime Minister Brian Mulroney announced Canada's decision to proceed with Space Station participation March 18 during a visit to Washington, D.C. to meet with President Reagan.

The Mobile Servicing Center would be a multi-purpose structure equipped with manipulator arms that would be used to help assemble and maintain the Space Station, as well as help upkeep instruments and experiments mounted on the Station's framework.

The Mobile Servicing Center would consist of a base structure with accommodations for payloads, orbital replacement units, utilities and thermal control. Included with this structure would be the Space Station Remote Manipulator System, end-effectors and servicing tools, and special-purpose dextrous manipulators.

As an adjunct to the design of a Mobile Servicing Center, Canada also will perform preliminary design on a fixed servicing site which could be used for working on attached payloads and for storing the space parts carried on the Mobile Servicing Center.

NASA is conducting preliminary design of hardware for servicing sites on the Space Station. NASA is also conducting preliminary design of a flight telerobotic system which uses a dextrous robotic device for working on spacecraft brought to the Station, or for in-situ servicing, repair and refurbishment of remote spacecraft when used as the "smart front-end" of an Orbital Maneuvering System.

This agreement covers design work during the remainder of the Phase B period. A formal decision by Canada to proceed with the development, operation and utilization of the Space Station will be subject to successful completion of Phase B activities, to the satisfactory negotiation of an arrangement for cooperation, and to the availability of funds.

NASA also last week concluded an agreement with the Science and Technology Agency of Japan for continued Phase B efforts.

Under the agreement, Japan will conduct preliminary design studies on a pressurized multipurpose research and development laboratory module which would attach to the Station.

The agreement between NASA Acting Administrator Dr. William R. Graham and Japan Minister of State for Science and Technology Mr. Yohei Kono is seen as a significant step in narrowing down the function and content of the Station elements which will be provided by America's international partners.

The Japanese module includes a scientific and equipment airlock, a work deck exposed to the space environment, a remote manipulator arm and an experiments/logistics module. The laboratory module will be designed to accommodate general scientific and technology development research and will also be the location for two important control stations.

The module would house the control panels for operating the Station's mobile remote manipulator system — the "arm on a trolly" that would move about the station structure — and it would house consoles designed to operate the payloads attached to the station structure.

The proposals agreed to by NASA and Japan's Science Agency cover the remainder of the Phase B period, which extends through January 1987, and do not obligate either country to actually develop the hardware.

NASA expects to complete the definition portion of the Phase B effort in the next few weeks, resulting in the selection of a baseline configuration for the Space Station. The actual development of structures and other hardware is scheduled to begin in mid-1987.

NASA and the Science and Technology Agency of Japan have agreed on the hardware elements Japan will carry into the remainder of the Space Station Phase B effort.

Nation explores future ELV options

As the nation explores its expendable launch vehicle (ELV) options in the wake of the *Challenger* tragedy, NASA is planning five ELV flights for the remainder of 1986.

The schedule calls for three Delta launches and two Atlas Centaur launches, with the first coming May 1 as Delta 178 launches GOES-G for the National Oceanic and Atmospheric Administration.

At present, the U.S. has eight Scout launch vehicles in various states of readiness, four complete Delta launch vehicles, and three Atlas Centaur vehicles. In addition, the U.S. Air Force is procuring 10 Titan 34D-7 rockets for support of national security payloads, according to Peter T. Eaton, Chief of the Expendable Launch Vehicles Branch in the Office of Space Flight at NASA Headquarters.

The Scout is manufactured by LTV Corp. under contract to the Langley Research Center. All planned launches over the next 3 to 5 years would be in support of Air Force or Navy payloads.

The Delta is manufactured by McDonnell Douglas under contract to the Goddard Space Flight Center. There are four vehicles ready to support launches in the next 12 months. Two of the launches will be GOES weather satellites for NOAA and the remainder will support Strategic Defense Initiative payloads.

The U.S. also has hardware on hand to construct three other complete vehicles, but assembly and checkout time is estimated at 20 months. NASA also purchased long lead time materials from McDonnell Douglas during the last Delta acquisition cycle, with eight sets now on hand. The first complete rocket based on that and other hardware could be available in about two years.

At present, the delta manufacturing capability is production of one rocket every two months, but Eaton said experts believe a rate of 12 per year would be possible.

The Atlas Centaur is manufactured by General Dynamics under contract to the Lewis Research Center. Eaton said there are three complete Atlas Centaur rockets in the inventory, with two launches planned for 1986. Production of additional Atlas Centaurs could take up to three years, with the first available around 1989.

Deltas are capable of launching from two pads at Kennedy Space Center and one pad at Vandenberg Air Force Base. Atlas Centaur rockets are supported by Pad 36A at KSC. Pad 36B is configured to support tests with the Shuttle Centaur upper stage.

The two GOES weather satellites to be launched for NOAA this year are an improved versions of the satellites which provide day and night meteorological images as well as vertical temperature and moisture data in the atmosphere. They also will collect and relay data from remote automated facilities, including ocean buoys, rain gauges, riger and tide gauges and automated weather observation facilities. The satellites also detect solar activity.

GOES-G is scheduled for launch May 1 aboard Delta 178 from Complex 17, Pad A at KSC. GOES-H is scheduled for launch Oct. 9 aboard Delta 179 from the same pad.

The two Atlas Centaur launches in 1986 will carry FLTSATCOM satellites for the Navy, Air Force and other elements of the Department of Defense. These are second generation communications satellites which provide secure communications between land-based facilities and ships, submarines or aircraft.

FLTSATCOM-F is scheduled for launch May 22 aboard Atlas Centaur 66 from Complex 36, Pad B. FLTSATCOM-G is scheduled for launch Nov. 6 aboard Atlas Centaur 67 from the same pad.

The remaining Delta launch, set for Aug. 14 aboard Delta 180 from Complex 17, Pad B will be an SDI research and development payload for the Department of Defense.

Bulletin Board

AIAA'S 11th Technical Symposium is May 9

The Houston Section of the American Institute of Aeronautics and Astronautics will hold its eleventh annual Technical Symposium May 9 at the University of Houston-Clear Lake. The objective of the symposium is to give all members of the local AIAA chapter and other professionals the opportunity to present their work without the expense of travel or the preparation overhead required by national meetings. Supervisors were encouraged by Associate Director Dr. Carolyn Huntoon, in a March 14 JSC Announcement, to "use this forum to accommodate early dissemination of work recently completed . . . Young members are especially encouraged to participate." There are no restrictions on the topics to be presented, and the theme of the symposium is "Space: The Next 15 Years." For more information, call Stephanie Vickery, Technical Vice Chairman, at 333-6407.

GSA vehicle sale is April 9

A public spot bid sale of approximately 134 government vehicles will be conducted by the General Services Administration beginning at 9 a.m. April 9 at the Gilruth Recreation Center. Vehicles to be sold include pickups, vans, 4-wheel drives, sedans and station wagons. The vehicles are 1978 to 1983 models. Prospective buyers will be allowed to inspect the fleet of vehicles from 8 a.m. to 3 p.m. on April 4, 7 and 8. The cars and trucks will be parked at the intersection of Second St. and Ave. B. Successful bidders will be required to make payment in full. Uncertified personal and company checks will not be accepted unless accompanied by a bank letter guaranteeing payment. For more information, call Floyd Milby at x3670.

MSFC commercial, FTS numbers change

Both the commercial exchange and the three digit Federal Telecommunications System (FTS) prefix numbers for the Marshall Space Flight Center were changed March 17. The commercial exchange will be 544 rather than 453 and the FTS exchange will be 824 rather than 872. Most of the four digit station numbers will remain the same, said JSC Mission Support Director Ronald Berry, and users who dial the old numbers after the cutover will receive an intercept message advising them of the change.

Symphony to present concerts of French music

The Clear Lake Symphony will present selections from the favorite French composers during two concerts to be held the weekend of April 5 and 6. The concerts are part of an annual series featuring music from different countries. The first concert will be held at 8 p.m. April 5 at the University of Houston-Clear Lake auditorium. The second concert will be held at 3 p.m. April 6 at the Dickinson High School. The program will feature "Concertino" by Shaminade, "Cello Concert" by Saint-Saens, "Petite Suite" by Debussy, "Overture to Orpheus in the Underworld" by Offenbach, and "Jeux d'Enfants" by Bizet. Ticket prices are $5, or $2.50 for senior citizens and students. Tickets are available at the Needle Art Shop on El Dorado, the UH-CL ticket window, or the North Galveston County Chamber of Commerce in Dickinson. For more information, call 488-1754.

JSC night at Astro World is April 4

The Employees Activities Association is sponsoring JSC night at Astro World from 6 p.m. to midnight April 4. Tickets for the evening will be $5, compared to the regular price of $14.95. The offer is open to all JSC and contractor employees and their families. The tickets are available at the Bldg. 11 Exchange Store.

AIAA plans spacecraft design lectures

The Houston Section of the American Institute of Aeronautics and Astronautics will offer an Invited Lecture Series on Spacecraft Design in April and May. The lectures will be held from 5 to 7:30 p.m. each Tuesday in April, and on May 6, May 13 and May 21. Speakers will include Dr. Maxime A. Faget, President of Space Industries, Inc., Seymour Rubenstein, Vice President and General Manager for the Shuttle Orbiter, Rockwell International Corp., John O'Neill, Assistant Director for Operations in the Mission Operations Directorate at JSC, and Jon D. Erickson, Manager of the Artificial Intelligence and Information Sciences Office at JSC. Registration is required, and is $90 for members and $115 for non-members. The lectures will be held at the Bldg. 2 Teague Auditorium. For more information, call Dr. J.C. Shadeck at 280-6007.

Dula to address lunch & learn program

Houston lawyer Art Dula will address a lunch and learn program at 11:30 a.m. April in the Bldg. 3 Cafeteria. Dula, specialist in legal matters relating to space exploration and utilization, represents several firms on the frontiers of space commercialization, including Space Services, Inc. and Eagle Engineering. He will discuss aerospace law as it relates to commercialization during his presentation. The program is sponsored by the AIAA's Space Systems Technical Committee. For more information, call Paul Kulesa at x6424.

BAPCO to meet April 15

The Bay Area PC Organization (BAPCO), the local IBM PC users' group, will hold its next monthly meeting at 7 p.m. April 15 at the Holiday Inn on NASA Road One. The group is open to all persons with an interest in microcomputers. BAPCO meets regularly on the third Tuesday of each month. For more information, call Earl Rubenstein at x3501 or Jack Calvin at 326-2983.

Notice to Retirees

Retired JSC employees who receive the *Space News Roundup* should contact the Personnel Office, not the Roundup office, for change of address notification. Send change of address information to Personnel Office, Mail Code AH76, NASA Johnson Space Center, Houston, TX 77058. Please allow 60 days for processing.

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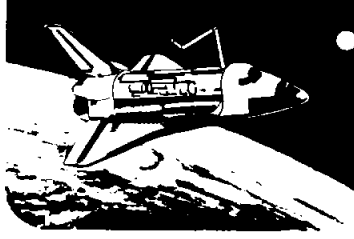

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Editor.....Brian Welch

Replanning effort outlined

(Continued from page 1)

"When it comes to this nation's assured access to space, the best way to go in 1986 is to get the Shuttles flying again," he added.

Truly said the first flight would operate under the type of very conservative ground rules which characterized the Orbital Flight Test era. The first flight will launch in the daytime from Kennedy Space Center, he said, under conservative weather conditions, will fly a payload with which the flight team has had experience in the past (such as a communications satellite) and will involve no groundbreaking efforts in the field of flight planning. The mission will land at Edwards Air Force Base during the daylight hours and from launch through landing will feature very conservative flight rules. He cited the minimum mission flown on STS-2, on which he was Pilot, following the loss of a fuel cell. Going back to those kind of flight rules, he said, is the way to get started.

He emphasized that the recovery plan involves a great deal of work, and sets a challenging path for the next several months. "We within NASA have suffered a terrible loss. It is proper for us to go out now and do a ton of work."

Text of Truly planning memo

This memorandum defines the comprehensive strategy and major actions that, when completed, will allow resumption of the NSTS flight schedule. NASA Headquarters (particularly the Office of Space Flight), the OSF centers, the National Space Transportation System (NSTS) program organization and its various contractors will use this guidance to proceed with the realistic, practical actions necessary to return to the NSTS flight schedule with emphasis on flight safety.

This guidance is intended to direct planning for the first year of flight while putting into motion those activities required to establish a realistic and an achievable launch rate that will be safely sustainable. We intend to move as quickly as practicable to complete these actions and return to safe and effective operation of the National Space Transportation System.

Guidance for the following subjects is included: Actions required prior to the next flight, First flight/first year operations, Development of sustainable safe flight rate.

ACTIONS REQUIRED PRIOR TO THE NEXT FLIGHT

Reassess Entire Program Management Structure and Operation

The NSTS program management philosophy, structure, reporting channels and decision-making process will be thoroughly reviewed and those changes implemented which are required to assure confidence and safety in the overall program, including the commit to launch process. Additionally, the Level I/II/III budget and management relationships will be reviewed to insure that they do not adversely affect the NSTS decision process.

Solid Rocket Motor (SRM) Joint Redesign

A dedicated SRM joint design group will be established at MSFC, with selective participation from other NASA centers and external organizations, to recommend a program plan to quantify the SRM joints problem and to accomplish the SRM joints redesign. The design must be reviewed in detail by the program to include PDR, CDR, DCR, independent analysis, DM-QM testing, and any other factors necessary to assure that the overall SRM is safe to commit to launch. The type and content of post-flight inspections for the redesign joints and other flight components will be developed in detail, with criteria developed for commitment to the next launch as well as reusability of the specific flight hardware components.

Design Requirements Reverification

A review of the NSTS Design Requirements (Vol. 07700) will be conducted to insure that all systems design requirements are properly defined. This review will be followed by a delta DCR for all program elements to assure the individual projects are in compliance with the requirements.

Complete CIL/OMI Review

All Category 1 and 1R critical items will be subjected to a total review with a complete reapproval process implemented. Those items which are not revalidated by this review must be redesigned, certified, and qualified for flight. The review process will include a review of the OMI's, OMRSD's, and other supporting documentation which is pertinent to the test, checkout, or assembly process of the Category 1 and 1R flight hardware. KSC will continue to be responsible for all OMI's with design center concurrence required for those which affect Category 1 and 1R items. Category 2 and 3 CIL's will be reviewed for reacceptance and to verify their proper categorization.

Complete OMRSD Review

The OMRSD will be reviewed to insure that the requirements defined in it are complete and that the required testing is consistent with the results of the CIL review. Inspection/retest requirements will be modified as necessary to assure flight safety.

Launch/Abort Reassessment

The launch and launch abort rules and philosophy will be assessed to assure that the launch and flight rules, range safety systems/operational procedures, landing aids, runway configuration and length, performance vs. TAL exposure, abort weights, runway surface, and other landing related capabilities provide an acceptable margin of safety to the vehicle and crew. Additionally, the weather forecasting capability will be reviewed and improved where possible to allow for the most accurate reporting.

FIRST FLIGHT/FIRST YEAR OPERATIONS

First Flight

The subject of first flight mission design will require extensive review to assure that we are proceeding in an orderly, conservative, safe manner. To permit the process to begin, the following specific planning guidance applies to the first planned mission:

- Daylight KSC launch
- Conservative flight design to minimize TAL exposure
- Repeat payload (not a new payload class)
- No waiver on landing weight
- Conservative launch/launch abort/landing weather
- NASA-only flight crew
- Engine thrust within the experience base
- No active ascent/entry DTO's
- Conservative mission rules
- Early, *stable* flight plan with supporting flight software and training load
- Daylight EDW landing (lakebed or runway 22)

First Year

The planning for the flight schedule for the first year of operation will reflect a launch rate consistent with this conservative approach. The specific number of flights to be planned for the first year will be developed as soon as possible and will consider KSC and VAFB work flow, software development, controller/crew training, etc. Changes to flight plans, ascent trajectories, manifest, etc., will be minimized in the interest of program stability. Decisions on each launch will be made after thorough review of the previous mission's SRM joint performance, all other specified critical systems performance and resolution of anomalies.

In general, the first year of operation will be maintained within the current flight experience base, and any expansion of the base, including new classes of payloads, will be approved only after very thorough safety review. Specifically, 109 percent thrust levels will not be flown until satisfactory completion of the MPT testing currently being planned, and the first use of the Filament Wound Case will not occur with the first use of the 109 percent SSME thrust level. Every effort will be made to conduct the first VAFB flight on an expeditious and safe schedule which supports national security requirements.

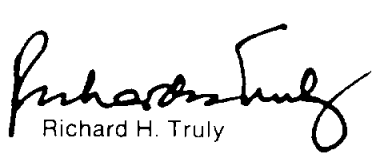
DEVELOPMENT OF SUSTAINABLE SAFE FLIGHT RATE

The ultimate safe, sustainable flight rate, and the buildup to that rate, will be developed utilizing a "bottoms-up" approach in which all required work for the standard flow as defined in the OMRSD is identified and that work is optimized in relation to the available work force. Factors such as the manifest, nonscheduled work, in-flight anomaly resolution, mods, processing team workloads, work balancing across shifts, etc., will be considered, as well as timely mission planning, flight product development and achievable software delivery capability to support flight controllers and crew training. This development will consider the availability of the third orbiter facility, the availability of spares, as well as the effects of supporting VAFB launch site operations.

THE BOTTOM LINE

The Associate Administrator for Space Flight will take the action for reassessment of the NSTS program management structure. The NSTS Program Manager at Johnson Space Center is directed to initiate and coordinate all other actions required to implement this strategy for return to safe Shuttle flight.

I know that the business of space flight can never be made to be totally risk-free, but this conservative return to operations will continue our strong NASA/Industry team effort to recover from the *Challenger* accident. Many of these items have already been initiated at some level in our organiztions, and I am fully aware of the tremendous amount of dedicated work which must be accomplished. I do know that our nation's future in space is dependent on the individuals who must carry this strategy out safely and successfully. Please give this the widest possible distribution to your people. It is they who must understand it, and they who must do it.



Richard H. Truly

Comets figure in cosmic history

Even before an armada of spacecraft met up with Comet Halley earlier this month, providing more data in a week than humans have gathered in three millenia, scientists were making connections between those legendary visitors and the history of our Solar System.

In a time of extraordinary returns from deep space probes, scientists continued to make connections between comets and a variety of epochol events of the past as they gathered last week for the 17th Lunar and Planetary Science Conference at JSC.

While shedding new light on several aspects of comets, the data from the probes — Europe's Giotto in particular — also have buttressed ideas scientists had even before the early March encounters.

The nucleus of Comet Halley, for example, was shown by Giotto to be a potato-shaped object about 10 miles long and 6 miles wide. Scarred and pitted by fissures and fumaroles, the surface of the comet is composed of some of the darkest material in the Solar System, "black as velvet," one scientist said. Some have suggested the material may be carbon or carbon based, and this has added some weight to the contention that the life-bearing carbon molecule may have been introduced to the primeval atmosphere of Earth by the impact of a comet several billion years ago.

Ironically, comets are seen not only as the possible source of life on Earth, but as a nemesis to life on the planet. In a paper published in 1980, a team led by physicist Luis Alvarez suggested that high amounts of the element iridium in a layer of clay at the boundary between rocks of the Cretaceous and Tertiary ages suggests the impact of a large asteroid 66 million years ago may have been responsible for the mass extinction of the dinosaurs and other lifeforms (one paper postulated North America as a high probability impact site for that event). Others have suggested that the impacting body may have been of cometary origin.

Recent findings from the Voyager II encounter with Uranus have led to suggestions that the gas giant and its battered moons were strongly influenced by catastrophic cometary encounters as well.

Yet another suggestion is that some comets have come into the inner solar system to die. This has been suggested for several years, but there has not been a method, until now, to test these objects which travel through space on comet-like orbits.

The data base used to support the all sky survey done by the Infrared Astronomical Satellite in 1985 lists 3,318 numbered asteroids and 109 comets, all of which were observed between 1982 and 1985. Twelve of those asteroids have characteristics which lead astronomers to the suggestion that they are burnt out comets. By assembling spectrophotometric data that describe colors and reflectivities of a certain group of asteroids — objects which are in comet-like orbits — researchers from the Planetary Science Institute in Tucson, Arizona and the University of Hawaii have shown a connection between their color and their position in the solar system.

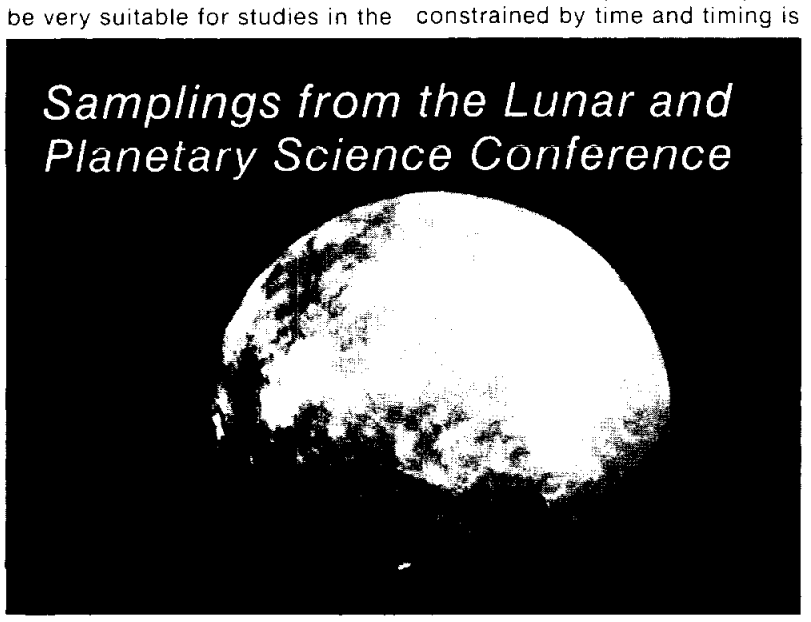
Indeed, there are a handful of asteroids in the Solar System which show signs of being burnt out comets — "icy bodies that had been flung into the inner Solar System, and had cometary activity until their ices were effectively exhausted," write astronomers William K. Hartmann, David Tholen and Dale Cruikshank. "Until now, there has been no further way to test whether these bodies actually were comets, or whether they came from a different source from other asteroids."

Now, using the spectrophotometric data, the three researchers say, there is "evidence that these bodies are indeed from the outer Solar System, and are hence different from most asteroids in the inner edge of the asteroid belt or on non-cometary orbits in the inner Solar System."

The researchers point out that if these objects, relatively close to Earth, are indeed dead comets, they may contain "abundant chemically bound water of hydration in their minerals, if not actual ices," making them the equivalant of oases in the desert of space.

Craters and the 'Technicolor Yawn'

In the pursuit of knowledge, scientists are renowned for their willingness to face hardships, endure the forces of nature or take on the extreme engineering challenge in an effort to arrive at the truth. The arduous treks to the Antarctic in pursuit of meteorites, a trip made by several JSC employees over the years, is a prime example. In the same vein, Mark Cintala and Friedrich Horz of JSC's Solar System Exploration Division and Tomas See of Lockheed's Solar System Exploration Department have been pursuing new forms of data collection through use of one of NASA's most demanding research tools—the KC-135 reduced gravity aircraft. In their studies of impact dynamics, the three are involved in a field which has broad implications for many other fields of planetary science. Much of what we know or infer about the formation of the Solar System and its ensuing 4.5 billion-year history is based on impacts. Asteroids crashing into moons and forming ring systems, large bodies striking the Earth and creating the Moon or dooming dinosaurs—those are examples of how important it is to understand what happens when things collide with a large planetary mass. In the course of these studies, researchers are faced with an inherent handicap—gravity. "Both theory and experiment lend strong support to the hypothesis that the results of an impact event are influenced by the strength of the gravitational field in which it occurs," Cintala, Horz and See write. "With this in mind, those planetary scientists who study impact craters find it sobering to note that every other solid body in the Solar System possesses a gravitational acceleration which is less than that of the Earth." The three suggest that the ability to modulate the gravitational field—as would be possible on the Space Station—will be one of the most important tools for impact researchers in the future. Until then, they are making do aboard the KC-135. They constructed what they describe as "a modest impact facility" for flight aboard the aircraft, and have found the conditions to be very suitable for studies in the realm of 0.1 to 2g's. The approach has been to keep it simple, "to learn as much as possible while keeping complexity and costs to a minimum." The impact facility is a projectile accelerator—actually, it's a standard air driven pellet gun—which fires into an impact chamber containing a relatively coarse grained sand. The firing is electronically controlled by a computer which not only records cabin pressure and aircraft accelerations, but controls the firing and generally acts as the event sequencer. This is not only useful, but necessary, the researchers have found. Even a simple facility like this is sometimes hard to use, they write. They are constrained by time and timing is critical, especially in a physically demanding environment. "The critical timing of various aspects of the operation becomes something of a burden for the experiment team—especially when many of the operations must be performed during the 2-g pullups and pullouts, when one of the team members is suffering from motion sickness (doing the 'Technicolor Yawn')." But through it all, they have gotten results. One is proof that as the g-level decreases, craters formed at a given velocity become larger. "The next step on the road to orbital experimentation," they write, "is the fabrication and use of a larger facility capable of supporting higher energy projectiles, greater target volumes and much lower atmospheric pressures."



Another reason not to smoke

The sample was exciting, to say the least. Taken from a lunar sea during one of the Apollo expeditions, the near microscopic bit of mare volcanic glass (which later would come to be known as the RHO sample) was an ovoid which contained about 54% lanthanum, cerium, praseodymium and neodymium and another 12% iron. This had not been seen before, and to J. W. Delano of the Geological Sciences Department at the State University of New York at Albany, the finding called for deeper study. Delano and R. A. Schmitt of Oregon State University were studying the glasses as part of an effort in which lunar soils are taken apart and examined in excruciating detail. Through this process, they hoped to add to the knowledge of lunar basalts and the types of volcanoes which existed on the Moon eons ago. Searching for answers, they wrote to JSC, seeking information on possible contamination of the soil by rocket exhausts. As the letter was passed around the Planetary Materials Branch here, Jim Gooding remembered a paper in which similar readings were atributed to lighter flints. "When you flick your Bic or strike a laboratory lighter," explained Branch Chief Doug Blanchard, "those sparks you see are actually something combusting. This leaves an almost perfect tiny glass sphere. Somehow, one of these bits of residue from a lighter got mixed in with the mare glass they were studying." Delano and Schmitt admitted the error during the conference with a paper combining equal parts of dry humor and a well intentioned warning to others. In "Warning to Lunar Glass Students. . ." they described how the RHO sample had come to surprise them, and warned others—cigarette smokers in particular—to be ever watchful. In the paper, they also gave the sample its new name, RHO, or, the Red Herring Ovoid.

North America may be impact site

Since 1980, scientists have been looking for the "smoking gun" that figured in the extinction of the dinosaurs. It may have been right in front of our eyes all along.

In a thought provoking paper presented at the 17th Lunar and Planetary Science Conference, B. F. Bohor and G. A. Izett of the U.S. Geological Survey point to evidence for North America as the site of the impact 66 million years ago which is believed responsible for the demise of the dinosaurs. One possible site is a large semicircular feature on the eastern shore of Hudson's Bay, known as the Nastapoka Arc. In these excerpts from "... Evidence for a North American impact site," the two researchers detail their findings.

The discovery of anomalously high amounts of the element iridium in a thin layer of clay exactly at the boundary between rocks of Cretaceous and Tertiary ages in Italy led Luis Alvarez and his coworkers, in 1980, to postulate that a large asteroid struck the Earth at the end of the Cretaceous Period some 66 million years ago. They reasoned that this impact raised a dust cloud that encircled the globe, shutting off sunlight for a period of months, thereby causing massive extinctions in life forms, including the dinosaurs, to occur. The thin clay layer containing the excessive amounts of iridium was considered to be the fallout from this dust cloud. This iridium-enriched layer has subsequently been identified at some 75 Cretaceous-Tertiary boundary sites workdwide.

In 1983, shock-metamorphosed quartz grains were discovered in an iridium-enriched Cretaceous-Tertiary boundary clay in Montana. Shocked quartz grains had previously only been identified in rocks associated with known meteorite impact craters (such as Meteor Crater in Arizona) and at sites of nuclear explosions. The unique parallel linear features seen in these quartz grains can form only under conditions of rapid, intense shock loading, such as occur during meteorite impact or nuclear explosive tests. Subsequent identification of shocked quartz grains in many widely separated Cretaceous-Tertiary boundary clay sites around the world that also contain iridium anomalies has confirmed the Alvarez impact theory by direct mineralogic evidence from the rocks themselves. These shocked quartz grains are particles of the target rocks ejected from the crater site by the force of the large impacting meteorite or asteroid, and carried in a cloud of debris around the world that subsequently settled out to form the thin boundary clay layer.

Although these discoveries have clearly shown that there was an impact of a large extraterrestrial body with the Earth 65 million years ago, the site of the actual impact crater still eludes us. This "smoking gun" would be the final bit of evidence for the impact scenario, and therefore the search for it is being actively pursued on several fronts. On the assumption that the grains of ejecta from the impact would settle out of the dust cloud as a function of distance from the impact site, we have examined the maximum sizes (diameters) of shocked quartz grains in the boundary fallout clay layer at several sites worldwide. Four of these sites are in western Norht America, five are in Europe (two in Denmark, two in Italy, and one in Spain), one in the North Pacific Ocean, and one in New Zealand.

It is immediately apparent that the shocked quartz grains with the largest diameters are found at the North American sites. These grain diameters (in millimeters) are 3-4 times larger in North America than at any of the other sites around the world, indicating that these North American sites were closest to the impact (within the limitation of the number of sites available for sampling). Furthermore, the estimated amounts of shocked quartz relative to unshocked quartz in each sample is highest for these North American sites also, again indicating proximity to the impact crater. Therefore, if we make the assumption that the maximum grain size (diameter) and amounts of shocked quartz are directly related to proximity to the impact site, the crater should exist somewhere on the North American continent from our data. A continental target site is much more plausible than an oceanic site because of the mineralogy of the shocked graines—quartz is generally not found in oceanic rocks, but is a common component of continental granites, sandstones, etc.

Where might a suitable crater be found on the North American continent? One possible candidate is the Manson, Iowa, structure that has been identified as a buried impact crater. It has recently been dated as no older than 70 million years, and is possibly younger. It is in the type of target rocks that would yield the quartz-rich fallout that we find in the Cretaceous-Tertiary boundary clays. The only major drawback is the apparent size of the Manson crater, which is only some 35 km (23 mi) in diameter. The Alvarez scenario postulates an asteroid 10±4 km in diameter striking the Earth, which would cause a crater some 100-200 miles in diameter (exact size depending on several variable factors of impact velocity, density, angle of incidence, etc.). However, the Alvarez asteroid size estimate may be too large and the resulting crater (if the other factors were just right) might be as small as 50 km (33 mi). The Manson structure is buried under at least 100 ft of glacial material, so its true size is not accurately known.

Another possibility for the Cretaceous-Tertiary impact crater may be the large, semicircular feature on the eastern shore of Hudson's Bay. This feature, called the Nastapoka Arc, is almost 300 miles in diameter, so that it is clearly large enough; it also is emplaced in the correct type of target rocks. However, it is difficult to study because it is covered by the waters of Hudson's Bay. Field studies seem to indicate that is is much older than 66 million years.

These two craters will be investigated further to see if either one can be shown to be the site of the Cretaceous-Tertiary impact event. Perhaps other candidate craters will be found in North America that fit the criteria of size, location, age, and type of target rocks.

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

Sale: Best on Taylor Lake, 3-2 on 2.25 acres, oaks, 300 ft. front, pier, 2-1/2 guest house, heated pool, spa off master BR, shop, garden bldg., sewing room. $350,000. Hu. (512) 935-2743.

Sale: Friendswood 4-2-2, Regency Estates, formal dining, built in '83, 1,989 sq. ft., all gas, hi-eff. AC, great room, $94,500. Steve, x4794 or 482-3696.

Rent: Bolivar beach house, 2-2, FPL, 3 blocks to beach and 6 mi. to ferry, $375/wk. Garlan, 333-3114.

Lease: Heritage Park 3-2-2, new section, formal dining, fence, new paint in and out, new carpet, refrig., FPL, lge. kitchen, $525/mo. 482-6609.

Lease: Friendswood 3-2-2, formal dining, fenced, new paint, FPL, lge. kitchen, $525/mo. 482-6609.

Sale: Modified A-frame, Toledo Bend lake front, 2 BR, loft, living, kitchen, bath, beautiful lot, $45,000. 864-8679.

Sale: Modern rustic, Toledo Bend lake front, 2 story, central H/AC, 3-2, FPL, paneling, wallpaper, surrounding deck, $69,900. 864-8679.

Sale: Fleetwood 14 x 80 mobile home, 3-2, storm windows, set up in Alvin park, low equity, assume notes of $266.50/mo. Wilbur, x3125 or 331-4280.

Rent: Custom furnished apt., fully equipped, 2-2, FPL, pool, W/D, $1,000/mo. w/contract maid service, $800/mo. without, avail. 4-1-86. Fred, x6226 or 326-1421.

Rent: Galveston Jamaica Beach/marina, sleeps 8, central H/AC, city services, $370/wk. 337-3970.

Sale: Burnet Co. land, 40 mi. NW of Austin, hunting, wooded, fenced, $1,995/acre. Bullock, 335-1262.

Sale: Morgan's Point 4-3-2, wooded tract, two wings, live in one, rent other, $82,500. (512) 634-2397.

Sale: Pearland 3-2-2, 1,630 sq. ft., curtains/mini-blinds, walk to school/park/library, no equity, assume 10.5% FHA, $75,000, you pay closing. 485-0076.

Sale: Horseshoe Lake Estates 3-1, AC, furnished, 1 acre, fishing lake, Trinity River. Susan, x3138 or 479-5594.

Rent: Lake Tahoe/Vegas/Phoenix condos, 1-2 weeks. Leisenring, x2228 or 474-5610.

Sale: 101 acre ranch, Marlin area, old bldgs., tanks, tractors, equipment, fruit trees, oaks, $775/acre, owner finance. (817) 896-3863.

Rent: New Orleans condo in French Qtr., Jazz Festival week, 4-25 to 5-2, "Penthouse," fantastic view, private rooftop sundeck, Faye, 280-3649 or 480-5656.

Rent: Galveston By-the-Sea luxury condo, completely furnished, 2 BR, sleeps 6, two-day minimum, or by week, month or year. Jay Clements, 474-2622.

Sale: League City Countryside 3-2-2, fenced, FPL, assume low equity 10.5% VA, no credit check. 333-4044.

Sale: Meadow Bend 3-2-2, less than 3 yrs. old, near Clear Creek High and park w/pool/tennis, low down, assumable 11% FHA, upper $60s. Mike, x5803 or 538-3355.

Sale/lease: The Gatsby 1-1 condo near College of Mainland, covered pking., all mjr. appliances, mini-blinds, FPL, pool, some furniture included, assume payments, no equity. Valerie, x2208 or (409) 935-1149.

Sale: Hobby/Gulfgate area 4-2-1, large den, fan, drapes, carpet, hi-eff. H/AC, garage opener, detached workshop, fenced, appraised at $52,200, make offer. Leona, x3338 or 643-4456.

Sale: Austin/UT condo, 1-1, on pool, 4 blks. to law school and stadium, $52,500. B. Craig, x4031 or 420-2936.

Sale: Pasadena Parkgate 3-2-2, FPL, lg. family rm., dbl. oven, covered patio, 9.5% assu., low pymts., $72,900. 487-3886.

Sale: Vail timeshare condo, 1 BR, sleeps 6, 1 wk, flex. time, 1 wk in bank, wld. wide exchange w/RCI, $9,685 ($4,000 equity), $115/mo. on balance. 487-3886.

Sale: '81 mobile home, 14 x 70, 2-1.5, large living area, upgraded carpet, vinyl, miniblinds, priced right. 534-2626.

Sale: Heritage Park 3-2-2, landscaped, fenced, privacy area, covered atrium, custom mini-blinds and drapes, refrig. included, $54,500. Karen, 482-3547.

Rent: Waterfront on Bay, 1 BR pole house, very quiet, no children/pets, 5 min. to NASA, $350/mo. 326-5244.

Sale/lease: Fairmount Park area 1-1.5 condo, 2-story, FPL, patio & balcony, refrig., W/D connect., near pool, 15 min. to NASA, covered parking, $300/mo. + dep. Diane, x3057 or 484-5256.

Rent: Barringer Knoll 2-1 condo, new paint, fan, W/D connect., 2 pools, $350/mo. 326-4395.

Sale/lease: Forest Bend townhouse, 2-1-1, quiet, spacious, well-kept grounds and pool, large discount, your choice of carpet, $37,500. Glenn, x6541 or 486-0462.

Sale: Barringer Knoll fourplex, 2-1, ex. cond., fans, W/D connect., 2 pools, 326-4395.

Sale: Heritage Park 3-2-2, fenced, garage door opener, storm windows, fans, drapes/miniblinds, end of cul-de-sac, $59,900. Don, x3958 or 554-4355.

Sale: Nassau Bay 3-2-2, 1 min. to NASA, all new interior, formals, FPL, new roof, lg. yd., mature trees, assumable FHA, $92,500. 335-1416.

Rent: 2 BR apt., new carpet, W/D conn., $330/mo. + $75 deposit. 480-6742.

Lease: Condo on Clear Lake, 2-1, all util. paid, 24-hr. security, pool, tennis, $500/mo. 480-5582 or 482-7156.

Cars & Trucks

'78 Buick Regal, ex. cond., $2,000 OBO. Glenn, 488-9005 or 335-1416.

'79 Chevy Malibu Classic wagon, V6, power, AC, auto, clean, $950. Thibodeau, x2687 or 480-0919.

'79 Toyota Corolla, AC, AM/FM/cassette, 4 spd., new tires/paint/carb./alt./brakes and more, very good cond., $2,650 OBO. Mike, x3532 or 486-8569.

'83 Mercury LN7, 5 spd., stereo, AC, new Michelins, ex. cond., 45K mi., $3,895. Lisa, x3945.

'73 Buick LeSabre, very sound, rebuilt trans., new engine parts, new battery, good tires & exhaust, good interior, $499. Peter, x4457 or 480-7564.

'76 Chevette, not running, good for parts, $120. Max Kilbourn, x4545 or 482-7879.

'83 Chevy S-10 truck, Durango, extend. cab w/jump seats, AC, PS, PB, AM/FM, auto, 2.8L V-6, 19K mi., under warranty, ex. cond., $6,350. Jim, x6226 or 480-2539.

'80 VW Rabbit, ex. body and inter., new tires, needs engine work, $600. Ferris, x2326 or 480-3676.

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

'84 Dodge Caravan, 2.6L engine, PB, PS, PW, cruise, auto, AM/FM, service policy, $9,500. 485-4426.

'80 Mercury Zephyr, 2 dr., AC, all power, AM/FM/cassette, sunroof, $2,000 OBO. 480-2372.

'79 Buick Skyhawk, AC, AM/FM/cassette, new tires, good condition, $2,600. 480-2372.

'76 Ford LTD, 2 dr. hardtop, AC, PS, PB, good condition, $1,300. Whitt, x5753 or 585-8308.

'78 Honda Accord LX hatchback, AC, PS, AM/FM/cassette, sharp in and out, reliable, orig. owner, $3,200. Steve, 554-6907.

'74 260Z 2+2 auto, 88K. mi., one owner, good cond., $4,500. 996-1691.

'83 Toyota Celica GT, 5 spd., pwr. pkge., cruise, extnd. warranty avail., 28K mi., perfect cond., $7,200. Pete, x5021 or 326-5464.

'74 F-100 pickup, needs battery, good work truck, $275. Claude, 488-9005, x272.

'85 200 ZX, 5 spd., fully loaded, low miles, like new. Diana, x4323 or 474-4325.

'82 Renault Fuego, new turbo and tires, 30K mi., must sell, $3,995. 338-2215.

'82 Toyota Supra S-type, 37K mi., new tires/muffler, 5-spd., sunroof, sunshade, $9,000 OBO. Dennis, 480-5879, x251 or 488-6975.

'71 Datsun 240Z, good engine and drive train, body rusted, $1,500 OBO. Dennis, 480-5879, x251 or 488-6975.

'71 Datsun 240Z, good engine and drive train, body rusted, $1,400 OBO. Dennis, 480-5879, x251 or 488-6975.

'84 Dodge Caravan, 2.6 ltr., PB, PS, PW, cruise, AM/FM, service policy, $9,950. 485-4426.

'84 Ford Crown Victoria, 20K mi., ex. cond., good family car, $7,300. 437-2677.

'82 Toyota pickup, deluxe, longbed, 5 spd., AM/FM, AC, new radials, 66K mi., $3,500. David, 333-0813 or 996-9715.

'76 Volvo 242, 2 dr., 4 spd., AM/FM, AC, many new parts, 92K mi. David, 333-0813 or 996-9715.

'81 Olds 98, 2 dr., full pwr., wire wheels, like new, true luxury car. 486-4633.

'76 Chevy Caprice Classic, 2 dr., 4 gd. tires, power windows/locks, tilt, nice car. 486-4633.

'72 VW Super Beetle, new tires, std., AM, running, economical, $700. 471-4843.

'79 Chevy Monte Carlo, 305 auto, PS, PB, tilt, cruise, Navy blue, high mileage, $1,000 OBO. Sandra, x4748 or 326-2380.

'75 Cadillac Coupe de Ville, very good cond., new tires rear, air shocks rear, $850. Dean, x3241 or 488-7032.

'82 Cutlass Supreme Brougham, 4 dr., auto V8, AC, cruise, auto windows and locks, service history, $6,500. Alan, x5348 or 334-5478.

'77 Camaro, red, 350 4-bbl., Keystone wheels, good paint job, $2,500 OBO. Cheryl, x5161 or 538-3043.

'53 Jeep w/283 Chevy engine, includes winch and dual wheel adapters, not run in year, needs rejuvenation, $500. Garlan, 333-3114.

'83 280ZX Turbo, fully loaded, 31K mi., must sell, $9,200 neg. Fred, x6226 or 326-1421.

'72 Honda 600 coupe, body and inter. good, engine runs but needs work, new brakes, $450 OBO. Craig, 332-4812.

Boats & Planes

18 ft. Hobie Cat, trailer w/fiberglass sailbox, ex. cond., $3,500. 538-4197.

14 ft. Manchac daysailer, rigging, main, jib, trailer, ex. cond., $2,200. 496-1123.

18 ft. AMF Trac catamaran, trailer and extras, like new, $4,450. 333-3056.

Lido 14 sailboat, sails and trailer. R. Hoover, x3138 or 996-7716.

'85 17-ft. America racing sailboat, spinnaker and trailer, fully rigged, fixed keel, scaled down version of America's Cup winner, ex. cond., $6,200. 480-5890.

15 ft. Invader, WTW, 50 HP Merc., galv. trailer, like new runs great, little use, fresh water only, ex. cond., extras, $3,500. 729-1209.

Audiovisual & Computers

Apple II+ computer, disk, Commodore color monitor, Olivetti ink jet printer, disk holder and software, $800. Jim, 280-2226.

Apple IIC system, w/monitor, modem, printer, cables, and S/W. John, 538-2803.

Magnavox home entertainment center, 25" TV, stereo unit, 8-track tape, AM/FM radio, all in all-wood cabinet, $125. Shirley, x2486 or 488-6310.

Adam computer w/printer, cassette drive, keyboard, $150. Marc, x6393.

Symphonic stereo system w/25 watt spkrs., turntable/tape player, 9 mos. old, paid $125, $75 OBO; Sony Betamax, needs belt, make offer. Valerie, x2208 or (409) 935-1149.

Cycles

'84 Honda CR250, ex. cond., must sell, $1,150. Bullock, 335-1262.

'72 Honda CX500, new tires, low miles, windjammer, helmet and manual, $700 OBO. 471-4843.

'78 Suzuki GS550, great shape, new mufflers and battery, cover, rack, manual, $675 OBO. Kent, x5561 or 488-7853.

'79 Suzuki GS1000L, new rear tire & brakes, license and inspection w/purchase, vetter full face helmet, $950 OBO. 332-4812.

'77 Honda Goldwing GL1000, red, $2,200. Jessie, x2421 or 538-1038.

'76 Kawasaki KZ900, ex. cond., under 10K mi., $1,000; 3 bike trailer, homebuilt, strong, $50. 480-5130.

Boy's 26" 3-spd. bike, good condition, $25. x2228 or 474-5610.

Household

Ceiling fan, never used, still in box, was $95, asking $60 OBO. Valerie, x2208 or (409) 935-1149.

Sears 3-level portable dishwasher, harvest gold, $200. Jessie, x2421 or 538-1038.

Wildlife art prints, assorted, signed, 22" x 28". 280-0909.

Area rug, beige, 6' x 9', $45; matching cushioned chairs, 2/$35; Cutco cutlery, 10 pc., like new, $50. 280-0909.

Henredon 80" traditional sofa, brown floral, pillows, $100. Henredon 40" sq. dark pecan coffee table, $100, both ex. cond. Susan, x6364 or 486-8865.

Contour chair, as seen on TV, never used, electrically controlled seating, various heat and vibration levels, cost $2,300, sell for $1,000. 488-1432.

Medium pile carpet with padding, ex. cond., reasonable, call for sizes, colors and prices. Steve, 335-1070.

Antique Victorian bedroom group, w/carved bed, dresser, 2 marble top tables and leather top desk, $3,200. 488-5564.

French game set table and 4 chairs, ex. cond., table opens to make larger table, $350. 488-5564.,

Wooden desk with leather inlays, 9 drawers, dark, 29" H, 23" D, 44" W, good condition, $65. Tony, x4061.

Double bed frame, box spring, mattress, like new, $75. Marian, x4991.

Limited edition prints by Charles Frace, G. Harvey & Donald Vann; also '84 Texas and Federal duck stamp prints. 332-1685.

Sears Kenmore dryer, 3/4 size, 6 mo. old, ex. cond., $175; king size waterbed, 2 matching night stands, beautiful wood, $300. Ra'chelle, x6581 or 331-5513.

Tan rocking chair, $50; student desk w/wood top, $75. 334-4894.

Wanted

Want roommate for large townhouse near NASA, large bedroom w/private bath, cable, FPL, W/D, extras, $250/mo. Clint, 488-8919.

Want to buy electric trains. Don, x2449.

Want persons to share booth at League City Village Fair on Mother's Day. Ruth, 532-1126.

Want girl's 24" or 26" bike. Chuck, x3127 or 333-3735.

Want Sears washer/dryer apartment-size stack. Debi, 333-2800 or 996-8102.

Want roommate to share house near San Jacinto So., $225/mo. 485-2462.

Want to buy Betamax VCR. Valerie, x2208 or (409) 935-1149.

Want to buy baby furniture: crib, changing table, chest of drawers, other items. Ann, x2868 or 538-3683.

Want to carpool from Brazosport area to NASA, 8 a.m. to 4:45 p.m. shift. Lisa, x3945.

Want to buy 14' alum. boat and trailer or boat only. Paul, 488-9878 or 484-3839.

Want to buy Evinrude motor, 100-125 HP, for parts, need not run. 484-6448.

Will babysit in my home, prefer 1-3 yr. old for playmate w/my 2 yr. old, Camino South. 486-5094.

Miscellaneous

Four mag wheels and tires for '76 Capri, $100; motorcycle saddlebags and windshield, $60. Jim, 280-2226.

Heavy duty basketball pole with welded backboard supports, excel. free standing setup, $75. Steve, x6128.

Hurricane twin fin surfboard, 5'5", $195. David, 488-3966.

Smith & Wesson 9 mm, 3 clips, M-459, $310; Ruger M-14F stainless steel, folding stock, new in box, $325. Wayne, x6226 or 486-7141.

Girl's clothes, sz/8-14, boys clothes, size 5, good variety, ex. cond. 488-6521.

Spalding skis, his and hers, $150/pr.; boy's bikes: Kent, $30; Schwinn Sting Ray, $40; 6 HP Johnson outboard, $400. 326-2187.

Interarms Virginian Dragoon 44 MAG revolver, new in box, never fired, with warranty, $195. 488-4807.

Genuine rabbit fur coat, Jr. sz. 9, $178 new, sell for $30. Ronnie, x5251 or 333-4389.

Exercise bike, $50 OBO. Tom, 480-2776.

Sliding glass door, $40; storm door, $30, aluminum ramps, $50. 485-2462.

Hamster deluxe habbitrail, accessories, $36; Sears rowing machine, like new, cost $350, sell for $185 or trade for exercycle. Max Kilbourn, x4545 or 482-7879.

Ford 6 cyl. engine, (170), no carb./trans./generator or starter, condition unknown, $60. Beatty, x2673 or 482-7938.

Pool table, 3 x 6, slate bed, ex. cond. accessories. 729-1209 or 495-4635.

Black Max rowing machine, like new, $75. Marc, x6393.

Zoom telescope with tripod, 15 to 45 power, new still in box, $55. 280-8796.

Sears 8 HP rototiller, ex. cond., $400; Sears riding mower, 7.5 HP, 24", ex. cond., $400; Stihl chain saw, $200; tool chests on casters, Sears best, new, $210 ea. Marilyn, x5475.

Two Remington 1100 shotguns, SA skeet, ventrib, 12 ga., $275; .410, new, $300. 474-2585.

Two 35 HP Johnson boat motors, $300 ea. Phillip, x5341 or 326-1408.

16 HP Speedex tractor, 44" mower, and weight rack. $1,300. Whitt, x5753 or 585-8308.

Musical Instruments

Baldwin Overture organ with conductor features, bench included, new, $1,800. Tom Clark, x7445.

Upright piano, $250. Julie, x3841.

Clarinet outfit, one year old, good cond., $150, cash only. Mary Lou, x5505 or 334-1345.

Cookin' in the Cafeteria

Week of March 31 — April 4, 1986

Monday — Cream of Potato Soup; Franks & Sauerkraut, Pork Chop, Potato Baked Chicken, Meat Sauce & Spaghetti (Special); French Beans, Buttered Squash, Buttered Beans. Standard Daily Items: Roast Beef, Baked Ham, Fried Chicken, Fried Fish, Chopped Sirloin. Selection of Salads, Sandwiches and Pies.

Tuesday — Navy Bean Soup; Beef Stew, Liver & Onions, Shrimp Creole, Smothered Steak w/Dressing (Special); Corn, Rice, Cabbage, Peas.

Wednesday — Seafood Gumbo; Roast Beef, Baked Perch, Chicken Pan Pie, Salmon Croquette (Special); Mustard Greens, Italian Green Beans, Sliced Beets.

Thursday — Beef & Barley Soup; Beef Tacos, Diced Ham w/Lima Beans, Stuffed Cabbage (Special); Ranch Style Beans, Brussels Sprouts, Cream Style Corn.

Friday — Seafood Gumbo; Fried Shrimp, Deviled Crabs, Ham Steak, Salisbury Steak (Special); Buttered Carrots, Green Beans, June Peas.

Week of April 7 — 11, 1986

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 April 14 — 18, 1986

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 Cod, 1/4 Broiled Chicken w/Peach Half, Salisbury Steak (Special); Cauliflower au Gratin, Mixed Vegetables, Buttered Cabbage, 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.