

## Update

### Test article damaged

The scheduled 510-second static firing of the Shuttle Main Propulsion System test article ended after nine seconds Sunday November 4 at NSTL in Mississippi.

December 14 is the tentative date for another test firing.

An automatic cutoff of the three-engine cluster of test hardware was commanded when a sensor detected excessive pressure in a cavity of the high pressure oxygen pump on one of the engines. Then another engine was damaged during the cutoff sequence.

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**Working launch date for the Space Shuttle is now June 30, 1980.**

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A hydrogen line rupturing near the base of the engine nozzle caused the damage. The line carries hydrogen through the nozzle for cooling purposes before it enters the combustion chamber. The rupture resulted in a hotter-than-normal "oxygen-rich" combustion.

Extent of the damage to the engine will not be known until a detailed inspection is completed.

The damaged engine was shipped to Rockwell International's Rocketdyne Division plant in California for a tear-down—thorough inspection and repair by Rocketdyne and Marshall officials.

### Orbiter APU runs successful

In other Shuttle developments, the Orbiter Columbia successfully passed a major test at KSC.

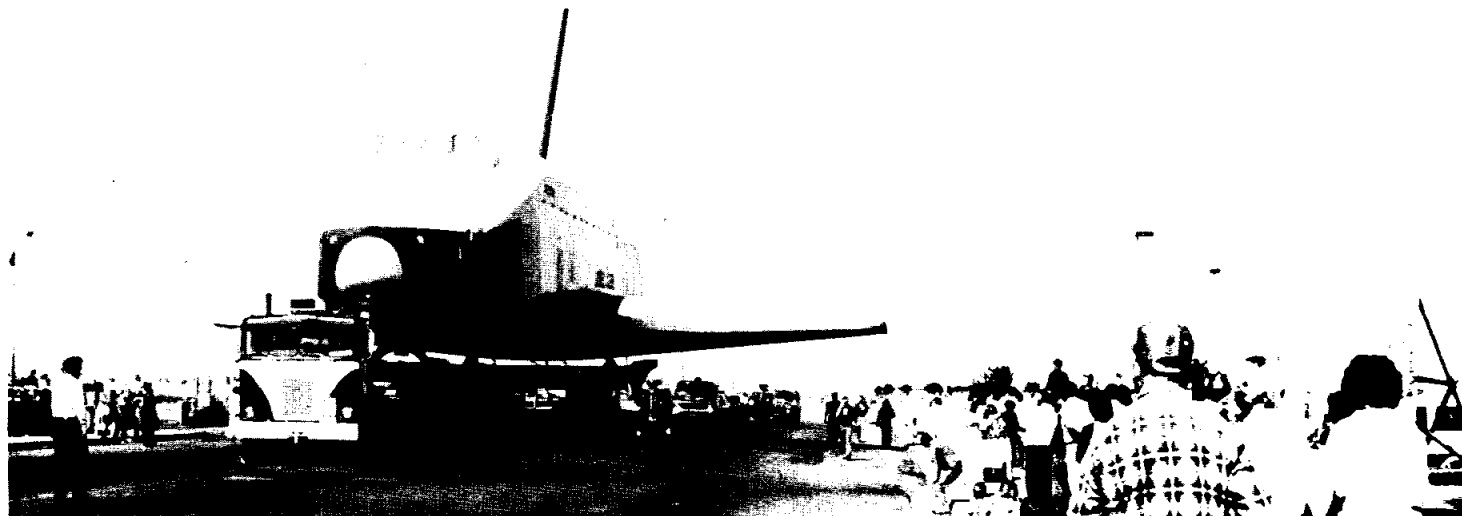
The Auxiliary Power Units, which provide hydraulic power to steer the Orbiter's main engine nozzles during launch and to drive aerodynamic control surfaces during flight through the atmosphere, performed as planned.

The hot fire tests were conducted November 1 - 4.

The three hydrazine-fueled units drive turbines powering hydraulic pumps. These were operated for up to 40 minutes in the tests which included sims of the ascent and descent phases of a Shuttle mission.

### Orbit in a Chamber

*The NOAA-B weather satellite is made ready for tests in a thermal/vacuum chamber at RCA Astro-Electronics at Princeton. The tests assure the vehicle can operate in the vacuum and extreme temperatures of Earth orbit. Scheduled for launch in 1980, NOAA-B is the third in a series of eight advanced weather satellites.*



Enterprise moved to Palmdale October 30 where its spare parts will be used in future Orbiters.

### New Jupiter Moon

*The white streak to the right reveals a newly discovered moon of Jupiter. This computer enhanced photo was taken by NASA's Voyager 2 last July 8. The moon, called 1979-J1, orbits at the edge of the Jupiter ring seen in this photo as a gray diagonal band across the picture. The other white streak is a star track. The new moon orbits Jupiter at 57,000 km from the top of the clouds. It moves faster than any satellite in the solar system, at 30 km per second, circling Jupiter each seven hours and eight minutes.*



### Runway Dead Ahead

*Loren Shriver runs through an entry on the Shuttle Procedures Simulator in Building 35 as instructor Mel Richmond looks on. Pilot astronauts who are not yet assigned to a Shuttle crew spend time in the SPS to become familiar with displays and controls for guidance and navigation. The first run is with automatic guidance, then the astronaut takes the controls for high and low energy entries (deorbit burns too soon or too late). Then instructors program in a "mystery case" to complete the training session.*

## Who is going to profit in the next 20 years?

### Third in a series on space industrialization

"After the Shuttle is fully operational, the trend to space industrialization will be irreversible, totally irreversible."

—Klaus Heiss, president Econ, Inc.

There is science. There is mankind's spiritual need to explore.

And there's a whole new industry NASA creates as the space program grows.

It will start with in-space production of Earth commodities and grow into manufacturing of products needed in space. From there it expands to mining the moons and asteroids from settlements on other planets.

The question today is who is going to profit from space in the next 20 years.

Communications and electronics industries are already operating commercially in space; in the next two decades

their returns will only grow. Agriculture and weather forecasting will improve; and as the military expands in space, the civil program benefits: Costs of operation go down as volume goes up.

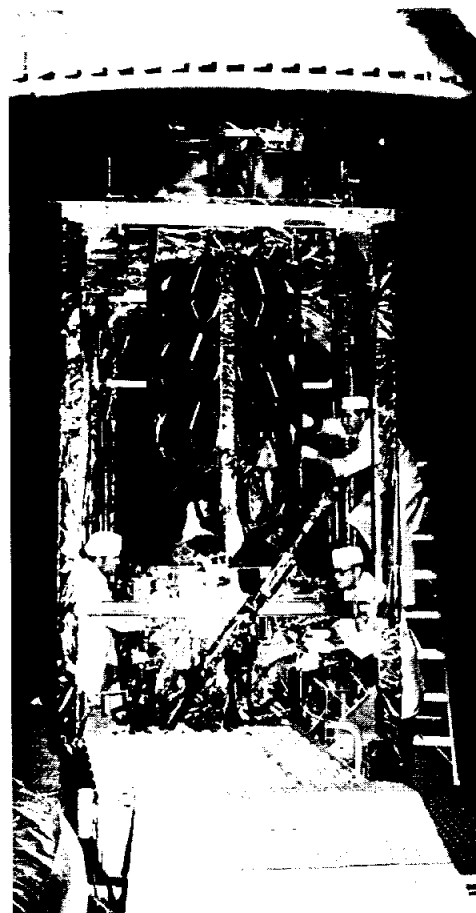
But new investors will have to take a 10 to 20-year risk—be entrepreneurs acting on a hunch. No one knows yet where the real benefits will be.

"Twenty years ago who would have predicted we would have global communications and pacemakers?" asks John Disher, director of advanced programs at Headquarters.

Charles Cheeseman of McDonnell Douglas agrees: "We're looking at billions of dollars in sales by the year 2000, most of which will come from products that people now aren't clever enough to have identified yet."

Speculation aside, gains for communications and electronics are real and within short-term grasp. "I refer to it as the complexity inversion process," says

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# Bulletin Board

Please limit announcements to 10 lines, double-spaced copy

## JSC Bike Club Up and Cycling

The new JSC Bicycle Club meets the first Monday of every month from 5-6 p.m. at Building 350 in the conference room. All bikers welcome! Come and participate with rides, parties, new bike routes, etc. For more information, contact Brian Morris, x-5293, or Micheal Drews, x-4326. Remember, whether you ride Schwinn or Hobbey or race Graf-Tek, you are welcome.

## All You Need Now Is the Stuffing

The annual Thanksgiving smoked turkey sale by the League City Evening Lions is presently underway. The turkeys are smoked by Sunday House, Fredericksburg, Texas, and sell for \$1.50 a pound. Orders may be placed by calling Jerry Maruska, 554-7248, or Dean Thompson, 483-4823.

## Here "The Odyssey of Apollo" Speech by Lloyd Swenson

Lloyd Swenson, NASA historian for the Apollo Project, will share behind-the-scenes stories of the Apollo missions at the quarterly meeting of the L-5 Society of Texas to be held at College of the Mainland, November 17 at 2 p.m. He will discuss some recent chronicles of the Moon project, the unique industry-government relationship that made it possible, and some reasons for the mission. Public is invited.

## Secretaries to Discuss Ad Valorem Taxation

Faye Ballard will speak on ad valorem taxation at the next meeting of the NASA Chapter of National Secretaries Association. Cocktails are at 5:30 and dinner at 6 (cost \$6). Meeting is at Nassau Bay Motor Inn November 17. For reservations call Elaine Ragan at x-3937 or 554-6765 or Bernice Woolsey at 747-8140. The group meets the fourth Tuesday of each month except December.

## Retirement Notices Due Today

Approximately 100 employees will retire this year before December 31, creating voluminous paperwork for Personnel. Anyone who plans to retire before 1980 should contact Diane Trahan or Nancy Gabriel at x-2135 by November 16. It is to your advantage to apply as early as possible to avoid unnecessary delays in processing, and in payment of accrued leave and annuity. "Early out" retirement expires December 31.

## Order Christmas Candy By November 28

Russell Stover candies for gift-giving, or just for eating, at a reduced quantity

price of 20%, can be ordered through your EAA representative. Orders must be submitted by November 28 for delivery to the Exchange Store the week of December 10.

## On Sale at the JSC Exchange Store

(Store Hours 10 am to 2 pm)

Dean Goss Tickets - \$10 Single  
\$20 Couple (Reg. \$14.50 each)  
ABC Theatre Tickets - \$2 each  
General Cinema Tickets - \$2.40 each  
Six Flags Over Texas Tickets  
\$7.25 for one day (Reg. 9.25)  
\$9.25 for two days (Reg. \$13.95)  
Astroworld Tickets - \$7.25 (Reg. \$9.25)  
Magic Kingdom Cards - Free  
Sea-Arama Marineworld Fun-Time Card - Free  
Entertainment 80" Coupon Books are now on sale at the JSC Exchange Store. Each coupon book is \$15. Special discount with FBA/EAA membership card.

## Coughing More Now And Enjoying It Less?

"Strategic Withdrawal from Smoking" will be the topic of the next Health Education Program to be held on Tuesday, November 20 at 10 a.m. and again at 1 p.m. in the Building 30 Auditorium. As you may recall, this program was conducted on September 13; however, rainy weather prevented many from attending. If you or someone close to you is trying to break the "habit," why not attend this program and pickup some useful hints.

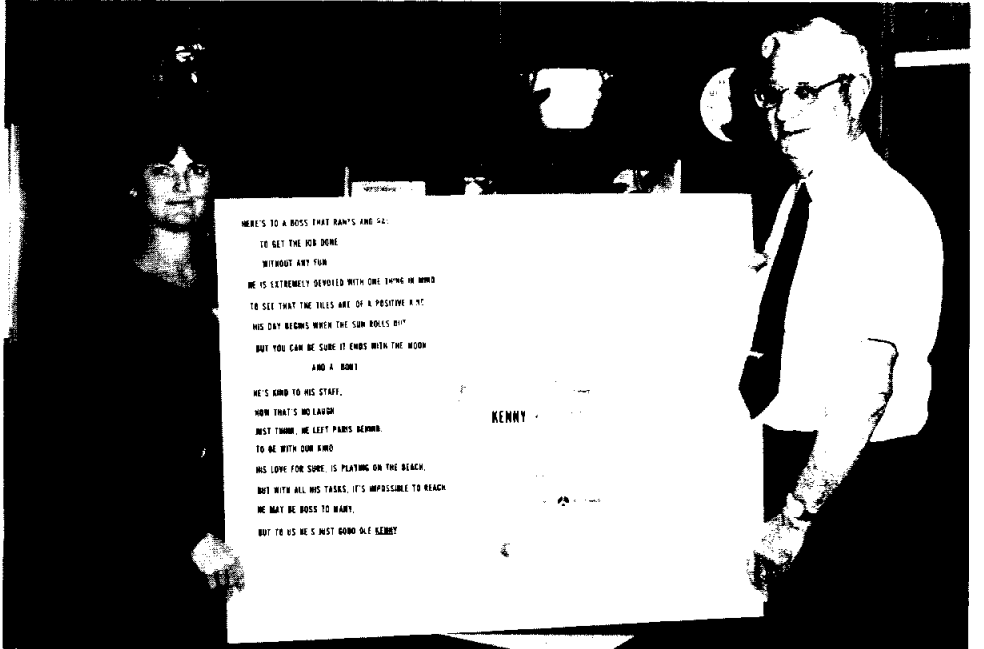


Care for a bearclaw?

*This ghoul appeared in the Building One concession area on Halloween. Strangely enough, Joyce Dushman was nowhere to be found that day.*



He contemplated a JSC tour but decided on Astroworld instead



## The OV-102 "Boss"

Ken Kleinknecht is JSC's "Boss" at the Cape for tile installation and other aspects of OV-102 manufacturing. As part of "Boss Day" at KSC he was presented this poster by secretary Jackie Norman.

## EAA Consumer Course Learn your rights

The ad reads "Money to Loan" and gives a local hotel suite as an address. There an oily haired man tells you he can get you \$1.5 million from a New York bank. Just fill out this form and leave a check for \$900. You call back two days later and he's left with no forwarding address.

"It happens all the time," says Don Smith of the Harris County District Attorney's office. "There might be one guy operating all over the sunbelt. The problem is getting an arrest warrant before he leaves town."

Smith was speaking at the first in a series of Survey Law courses in Gilruth Center Tuesday nights, this class: "Consumer Fraud, Consumer Rights." The idea gelled when a lawyer in Ann Walker-Voss' office got tired of people

asking for free legal advice. She contacted JSC's General Counsel office and the Harris County D.A., and through EAA channels put together the four sessions.

With hardly any publicity the room was packed to hear Smith talk on consumer fraud or "crime in the suites."

"Instead of using a gun to take your money, they use a smile and a handshake," he said. "It's robbery, but the problem is convincing a jury beyond a reasonable doubt that there was criminal intent."

"You can't make a person do a good job," he said. "Poor workmanship is not a crime. A common defense in these cases is 'We're not criminals, we're just bad businessmen.'"

Smith's advice is to ask questions. Ask for references. Where has this man worked before? "An honest businessman will not be ashamed of the work he's done," Smith said.

Six out of 10 consumer complaints to the D.A.'s office are about automobiles, repair and sales. Thirty percent concern home repair, and the rest "cover the whole gamut: travel agencies, phony concerts, and the typical business opportunity scheme," Smith said.

"Watch out for work-at-home schemes," he advised. "There's no way you can make money shipping out of your garage. You can't do the volume. Or the product won't 'meet up to the standards.'"

But the soundest advice Smith repeated through the lecture was: "If it looks too good to be true, you can be sure that it is."

## Flu Shots

Flu shots are available on a drop-in basis at the JSC Clinic, 10-11:30 a.m. and 3-4:30 p.m.

## At Other Centers

### Marshall Machine Measures Roundness of Objects

The roundness of an object can be determined to an accuracy of .005 of a micrometer using a unique new device at Marshall.



Employees are shown here measuring a small quartz ball to a diameter of exactly .038 meters using the Ultra High Precision Roundness Measurement System.

The equipment will be used primarily to measure sphericity of rotors for gyroscopes for Marshall's Gravitational Probe B, anticipated for launch from the Shuttle in the mid-1980s. GP-B will be an Earth-orbital mission to measure the change of axis which Einstein's theory of relativity predicts will occur in a spinning body revolving

about a larger mass.

### Gossamer Albatross To Fly at Dryden

NASA will sponsor a short-term flight research program with the human-powered Gossamer Albatross. The two-month flight program, sponsored jointly by Langley and Dryden, will study the flight characteristics of a lightweight, low-speed aircraft for possible application to future aircraft capable of flight at extreme altitudes.

Gossamer aircraft are powered by the pilot who pedals a bicycle-like arrangement that drives the propeller.

The program will emphasize using a lightweight data system to measure stability, control, and performance characteristics. The aircraft will be flown at NASA Dryden first using human power. Later an electric motor will be used for steady-state conditions.



### Car of the Future Studied at JPL

An electric-powered car was unveiled for West Coast reporters at JPL recently prior to extensive testing by the Lab's Electric and Hybrid Vehicle personnel. The Electric Test Vehicle, which could be mass produced by the mid-1980s, presently can range from between 75 and 120 miles before recharging, and has a top speed of 65 mph at an estimated operating cost of 18 cents per mile.



# The Mars Project

Mars. Rotating in its orbit untouched for billions of years. From the direction of the sun come 10 spacecraft which descend and retrofire into orbit around the planet. Spaceboats carry crewmembers from passenger to cargo ships, and the Earthmen prepare to land.

Wernher von Braun published *The Mars Project* in 1953, a plan for a flotilla of 10 vessels to make a 969-day mission to Mars. He covered thermal protection and aerodynamics for Earth and Mars entry and wrote out equations for every step from spaceship design to orbit of departure.

Three Space Shuttle Orbiter-like vehicles (one on skis) would land on the planet, bringing a 70-member crew down for a year's stay.

Von Braun envisioned a vertical launch from Earth with three-stage rockets carrying the interplanetary vessels. (Cost is not covered in the paper.) The first two stages would jettison residual propellants and make chute landings in the ocean.

The third stage, a winged ship, puts the payloads into orbit, then returns to Earth "gradually assuming the characteristics of a conventional aerodyne which approaches Earth in an extended decelerated glide.

"The skin attains a maximum temperature of 1,005 degrees K. It would seem just within acceptable limits for scale-resistant steel alloys of good tensile strength."



"Warping of the fuselage and distortion of wing contours could be prevented by application of a shingle-like skin structure."

All three stages would be reusable.

The 10 vessels, in position above Earth, would be ready to maneuver into an "orbit of departure" which von Braun describes as "a free coast through an escape hyperbola" using Earth momentum to put the ships into "a circum-solar ellipse with an aphelion a few thousand kilometers from Mars."

Applying Kepler's laws, von Braun puts the length of passage at 260 days.

When they reach the planet, the ships would be allowed to fall toward Mars to the desired altitude, then decelerate with "a rocket counterblast" putting them into orbit. Crewmembers on the seven passenger vessels would then ride on "spaceboats" to the three cargo ships which contain the landing boats.

"It would be best for the first ship to

land on a snow-covered polar area on skis or runners," von Braun states. The first crew would then proceed in ground vehicles to the equator and prepare landing strips in the rocky terrain for the other two winged ships.

Skin heating is not as big a problem in the Martian atmosphere, von Braun says.

He does not go into details of what the crew will do during its year's stay. Presumably they would explore and begin construction of a domed settlement.

But he does allow room on the return trip for "Martian objects collected"—using the space where burned fuel was stored. And he mentions that "the crew

will have the opportunity to see Earth transit across the face of the sun on the 73rd day of the return trip."

The publication includes tables, charts, and diagrams that explain departure maneuvers, "astronomic and physical data," skin temperature rises, and even tonnage required for food, fuel, oxygen, and water.

There is a kind of disclaimer in the introduction: "The study applies exclusively to the *mechanical* problems," it says. "The very nature of such limited work on such a broad subject precludes its being anything but a relatively rough outline."

But it's certainly an idea to build on.

## Winter Nutrition

Banana cake, eggnog, and turkey stuffing lurk around every corner these weeks, ready to turn your summer svelte body into a holiday butter ball. "But I need extra calories to stave off the cold," you rationalize.

"That's a myth," says Dr. W. R. Hawkins of the JSC Clinic. "If anything you should eat less in winter."

If you're wearing a winter coat and are as active as during the summer months, you won't need much more calories than it takes to carry the extra weight of the coat—about a half a square of fudge per week.

However, most people are less active in winter. When you sit before the fire reading, your metabolism does a slow burn, about 85 calories per hour—compared with the 250 calories you burned taking an after dinner walk last summer.

"Fruits are especially important in winter," Dr. Hawkins says, "because you are more susceptible to infection. And a well balanced diet is important all year round."

However, eating more to counteract cold weather, building up fat as a thermal protection, "is not a factor at all," Dr. Hawkins says.

Then after the holidays, "if you lose weight properly, you shouldn't lose more than a pound a week," he says.

So a few days of gorging at grandma's could create a need for a 10-week diet. It's hardly worth it.

Be careful, or be corpulent.

## KEEP A TIGHT REIN...



ON RISING COSTS BY SENDING YOUR COST REDUCTION REPORT ON JSC FORM 1150 TO: BE-3 COST REDUCTION OFFICE

### Roundup Distribution

Is everyone in your mail code receiving Roundup? Do you get extra copies? Update distribution by filling out a JSC Form 2271. Under "All Employee Distribution" put the number of employees—both contractor and NASA—in your mail code area. Send the form to Distribution, JM86.

### Gift Idea

Only 32 more shopping days until Christmas. Have you ordered your Getaway Special yet? The small Shuttle payloads are only \$3,000-\$10,000—an ideal present for your precocious child, and easily within any General Schedule employee's budget.

## Profit in next 20 years

Continued from Page 1

Disher. "Right now we have small communications devices in space and large objects on the ground, using conventional wire.

"In the future we will reverse the process: Have large devices in space and small objects on the ground, using microwaves."

The size of a launch vehicle limits the size of today's satellite. With the construction and repair in orbit that will come with the Space Shuttle, communications satellites will get larger and more sophisticated. They will be gathered in one place on platforms.

"Results we can see today will be lower cost of phone bills and mobile communications," Disher says. "But more important will be new developments such as wrist-phones and television conferences.

"It will cut out a fair amount of travel expense."

However, profit to new areas of the private sector is still only conjecture. Innovations in materials processing won't be seen for a few years. "Until we get experimental data from Spacelab, it is hard to be specific," Disher says.

The near perfect electronic crystals that astronauts will produce in space pose the same problem. "They would have greater power-carrying capability," Disher says. "They could be used for something you couldn't do any other way."

Again there is a latent potential, based on discoveries yet to be made.

*Business Week*, in a special issue on the future in space last year, struck the tone: "As far as industry is concerned, the airliner-size Space Shuttle is by far the

## NASA creating joint ventures

Headquarters has set up guidelines for joint ventures which will make it easier for U.S. companies to use the environment of outer space for commercial manufacturing.

NASA is offering industry "equity partnership ventures," an arrangement where the risk capital and technical know-how of industry works in concert with the resources of NASA.

The goal is to develop and enhance U.S. commercial leadership in space.

To this end, NASA is providing a number of incentives to American industry, including: flight time on the Space Shuttle, technical advice, consultation, data, equipment, joint research programs, and proprietary information protection.

American companies desiring more information on NASA's joint venture program should contact Dr. John Caruthers, Director, Materials Processing in Space, Code EM-7, NASA Headquarters, Washington, D.C. 20546.

most important development in the 20-year-old space program.

"In fact, some experts are calling it the key to opening up the next industrial revolution."

NASA has booked the first 40 Shuttle missions with scientific, military, electronic, and communications payloads. The wise entrepreneur will keep his eyes on developments in space; it is in the next few years he will see where to invest.