

Ticket Inundation



BURIED—Jerry Haptonstall, Employee Activities Association vice president for social activities, is seemingly overwhelmed by \$37,871.75 worth of Hemisfair bonus books bought by MSC employees. In all the book orders turned in by 44 EAA officers and representatives, there was a shortage of only 25 cents. EAA president Ed Stelly had the largest order with \$6,454.

Kraft Assigns Kranz, Lunney To First Manned Apollos

Eugene F. Kranz and Glynn S. Lunney have been designated as lead flight directors for the first two manned Apollo missions, Christopher C. Kraft, Jr., Director of Flight Operations, announced last week.

Lunney will be the flight director for the first manned Apollo flight. He was a flight director for Gemini missions IX through XII and lead flight director on Apollo 201 and on Apollo IV, the first flight of the Saturn V.

Kranz will be the flight director for the second manned Apollo mission. He was a flight director on Gemini missions IV through IX and directed the Apollo V mission, the flight of the first lunar module.

The appointment of three new flight directors for the Apollo program was also announced by Kraft. The longer and more complex Apollo missions of the future will require more advance

Academy Elects Gilruth Member

MSC Director Dr. Robert R. Gilruth has been elected a member of the National Academy of Engineering "in recognition and in honor of his important contributions to engineering and of his leadership in the field."

The Academy was established in 1964 by the Council of the National Academy of Sciences. Election to the Academy is one of the highest professional distinctions that can be conferred on an American engineer and is limited to those who have made important contributions to engineering theory and practice or who have demonstrated unusual accomplishments in the pioneering of new and developing fields of technology.

Gilruth was elected a member in recognition of his work in aircraft design and testing and for development and operation of manned spacecraft.

planning involving the flight director, and the duty of flight directing will become more of a full-time job, Kraft explained.

Named were M. P. (Pete) Frank, Gerald D. Griffin, and Milton L. Windler. The three new flight directors will be assigned to the staff of John D. Hodge, Chief, Flight Control Division.

The new flight directors are all from divisions in the Flight Operations Directorate, and each will be relieved of his current duties for the new assignment.

Frank, 37, was born in Bryan, Texas. He was graduated from the University of Texas with a BS degree in aero engineering and received a MS degree in mechanical engineering from the Drexel Institute of Technology in Philadelphia. He joined NASA in October 1962. He is married to the former Barbara Rumph of Ft. Valley, Georgia and the couple has two children and reside in La Porte, Texas. His current assignment at MSC is Chief, Lunar Mission Analysis Branch, Mission Planning and Analysis Division.

Griffin, 33, was born in Athens, Texas, and was graduated from Texas A&M University with a BS degree in aeronautical engineering. He joined NASA in June 1964. He is married to the former Sandra Jo Huber of Brownwood, Texas, and the couple has two children and reside in Nassau Bay across from the Center. His current assignment at MSC is Assistant Chief, Command and Service Module Systems Branch, Flight Control Division.

Windler, 36, was born in Hampton, Virginia, and was graduated from Virginia Polytechnic Institute with a BS degree in aeronautical engineering. He joined NACA (NASA's predecessor) in June 1954, and except for a tour of duty with

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ROUNDUP

NASA MANNED SPACECRAFT CENTER

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Balky S-IVB Engine Forces Alternate Apollo VI Mission

The Apollo VI mission in a second unmanned test of the Saturn V launch vehicle stack was a mixture of success and failure. The S-IC first stage performed faultlessly, but early shutdown of two of the S-II second stage engines and failure of the S-IVB to restart for a simulated lunar injection burn, marred the otherwise successful mission.

Early cutoff of S-II engines 2 and 3 caused a longer first burn of the S-IVB's single J-2 engine to achieve orbital insertion targeting. Enough fuel was remaining in the S-IVB to make the lunar injection burn which would have carried the S-IVB out to approximately 279,000 nm.

Failure of the S-IVB engine to restart as programmed forced a switch to an alternate mission plan using the Apollo spacecraft service propulsion system to achieve the desired spacecraft apogee of 12,000 nm.

In a postflight press conference Apollo Program Director Maj. Gen. Samuel C. Phillips said, "I see ahead several days of very hard work to gather and evaluate the data to establish the

facts and the corrective action and the testing required to evaluate those fixes." (to the launch vehicle.)

"We will certainly be considering the full range of our ground test program as well as the question of flying the 503 Saturn V on the unmanned flight for which it is currently being prepared," Phillips continued.

"I think it is significant to the future of our program that these substantial malfunctions that altered significantly the course of the mission failed in a safe way," Phillips said.

MSC Director Dr. Robert R. Gilruth said, "It was fine day for the spacecraft: all the systems performed well. In fact, we had an excellent test of the service propulsion engine in its initial burn right after separation from the S-IVB, and all other systems performed well."

An initial review of Apollo VI data by program engineers was published Monday with the following conclusions:

Although an alternate mission was selected because of Saturn V launch vehicle problems

which prevented achievement of some major objectives, spacecraft accomplishments were impressive. The evaluation will continue for several weeks, and early results are subject to change, but it is obvious that spacecraft systems survived severe tests in good condition, engineers said.

Major accomplishments include:

- The longest single inflight burn of the service propulsion system, seven minutes, 25 seconds, which exceeds the most severe requirement on a lunar mission.

- The guidance and navigation system controlled the long burn perfectly, guided the spacecraft to the proper apogee, and early evidence indicates the system worked well during entry.

- The reaction control system held the spacecraft in proper attitude, including during the long cold soak period.

- Spacecraft heat protection was demonstrated again. Even though entry velocity was not as great as originally planned, the value reached exceeded earth orbital entry velocity by a considerable margin.

- The new unified crew hatch and seals withstood the mission in good condition.

- The fuel cells performed well despite a long storage period and considerable open-circuit operation during preflight activities.

Some relatively minor problems were found, but they did not affect the course of the mission.

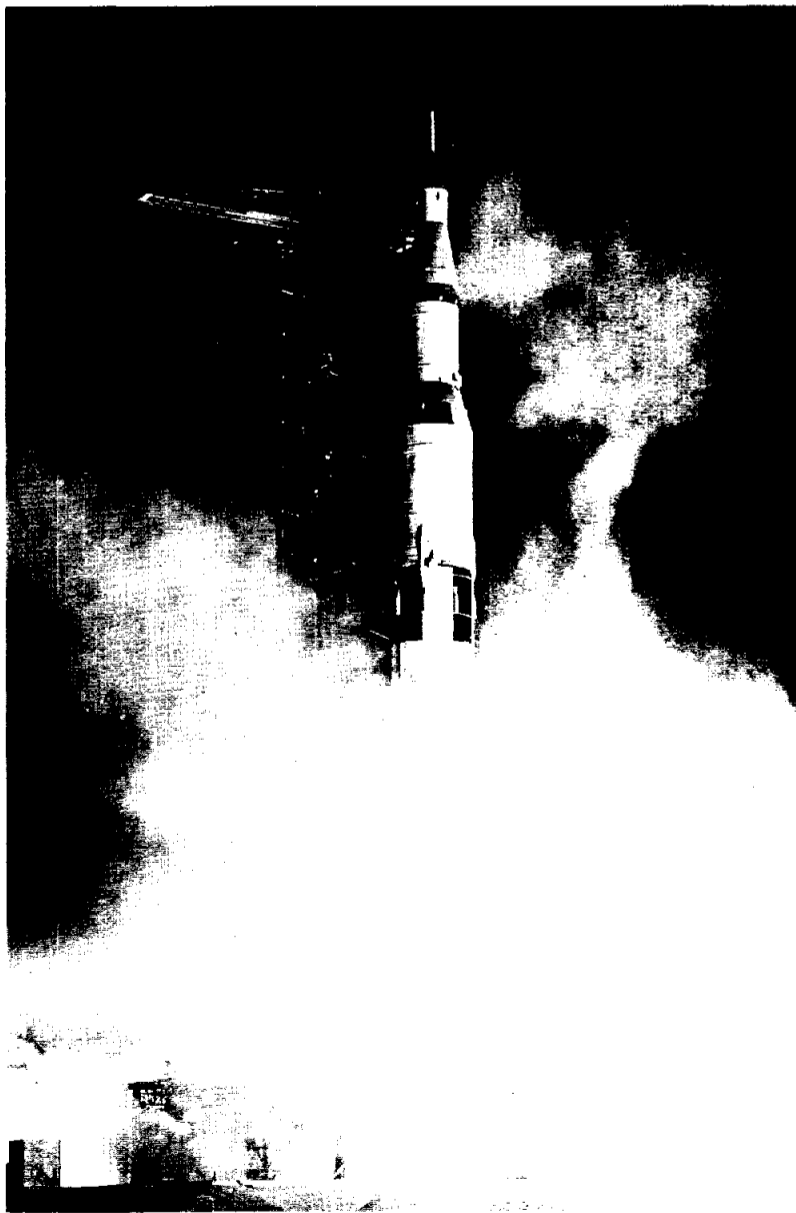
Shortly after the three-hour mark in the mission, the essential electrical load automatically transferred from ac bus 1 to ac bus 2. Preliminary information does not provide the reason, and it is still under investigation.

Telemetry data became erratic for several minutes during the launch phase, so that further data are required to verify the emergency detection system sequence during operation of the second and third stages of the launch vehicle. In general, the instrumentation system performed satisfactorily, and data show the EDS operated properly during liftoff and first stage thrusting.

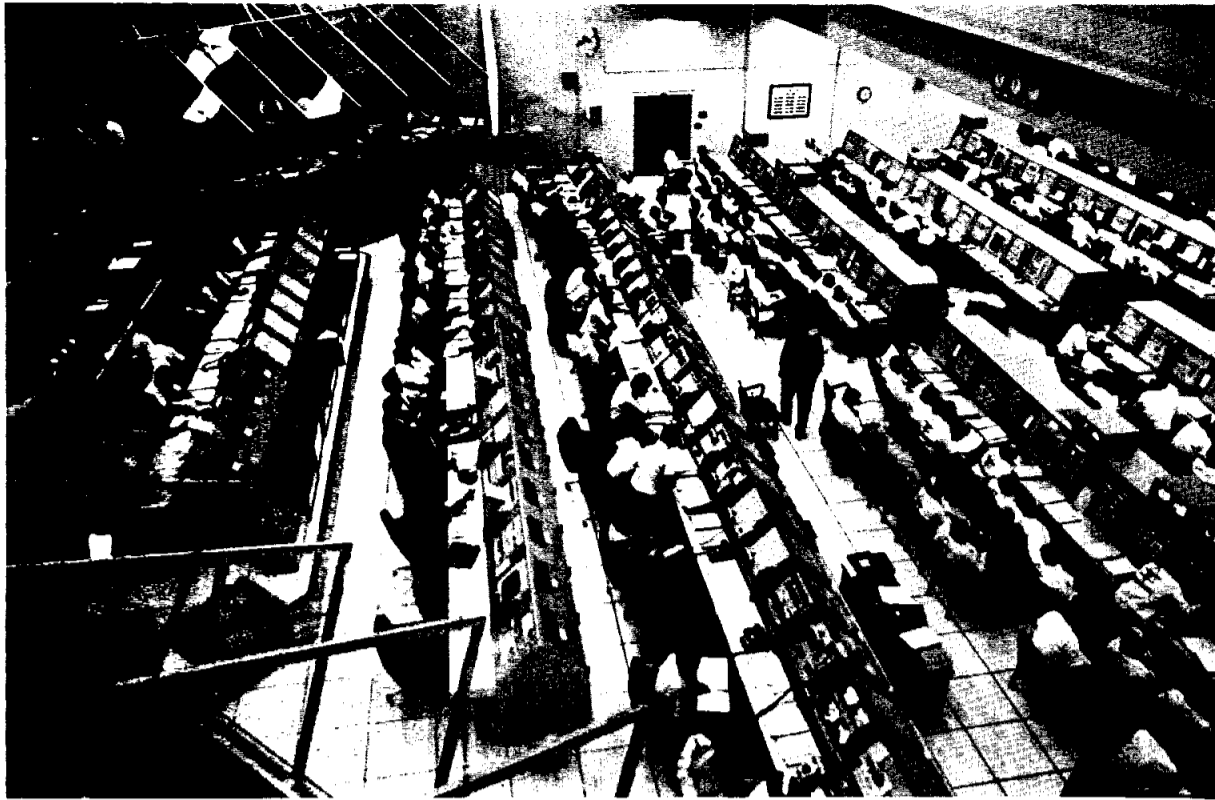
About two minutes after liftoff, vibrations, accelerations and outrigger strains indicated an unexpected change in LTA-2R dynamic characteristics. This may have been an instrumentation problem and thus not a significant event. The test article was flown in place of a lunar module.

Entry velocity was about 4,000 feet per second less than planned (36,500), but the velocity that was achieved (32,776)

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THE SOUND AND FURY that signifies Saturn V made one's very innards vibrate from three and a half miles away as the Apollo VI lifted off Launch Complex 39A at 6 am CST April 4 in the second unmanned test of the Saturn V launch vehicle. Early shutdown of two second stage S-II engines and failure of the third stage S-IVB engine to restart for a simulated lunar injection caused the mission to fall short of reaching all objectives.



WHERE THE BUTTONS ARE—Firing Room 2 adjacent to the Kennedy Space Center Vehicle Assembly Building serves both as a checkout center for operations in the VAB during Saturn V stacking and as a launch operations room, as shown here prior to Apollo VI liftoff. A myriad of telemetry and television monitoring channels drive displays on the more than 100 consoles in the firing room.



LOOKING OVER SHOULDERS—Marshall Space Flight Center director Dr. Wernher von Braun, left, and NASA Deputy Administrator Thomas O. Paine chat in the Firing Room 2 VIP viewing room during the early morning hours of the Apollo VI countdown.

Apollo VI Goes to Alternate Mission

(Continued from page 1)

was midway between the entry velocities of command module 017 on the Apollo IV mission (36,545) and command module 011 on the Apollo/Saturn 202 mission (28,512). Engineers deem this a valuable point in the overall evaluation of the heat shield characteristics and entry guidance performance.

After the launch vehicle's third stage failed to fire for the simulated translunar injection, the SPS was used to achieve the desired spacecraft apogee. The SPS was fired continuously for seven minutes, 25 seconds under guidance and navigation control, and the engine operated normally throughout the burn. It was the

longest single SPS inflight firing to date and demonstrated the capability of the system to accomplish the burn necessary to take the Apollo spacecraft out of a translunar trajectory and place it into an orbit around the moon.

A second firing of the SPS was inhibited because not enough of the desired velocity change could have been gained with the propellant remaining after the long burn.

The six-hour cold soak was accomplished as planned to achieve minimum temperature of the command module ablator before entry. Minimum at the ablator bondline was approximately -80 degrees F, indicating that the pre-set cold soak atti-

tude was correctly maintained.

Charring of the heat shield was similar to that seen on the Apollo IV spacecraft. Figures on charring and entry temperatures are not yet available. The extravehicular activity handles and the sea anchor attach point were in essentially preflight condition.

The unified crew hatch and seals were in good condition, and the opening mechanism operated properly. No structural damage was found during the initial visual observation of the spacecraft. The windows appeared relatively clean, with condensation on the inside of the heat shield panes.

Performance of the environmental control system was satisfactory. Cabin pressure stabilized at about six pounds per square inch after cabin pressure relief valves seated at 8½ minutes into the mission. Pressure decayed to 5.8 psia prior to entry, indicating that the cabin leakage rate was negligible.

No attempt was made to control cabin temperature, and the control valves were set at the full cold position. The average

cabin temperature remained at 64 degrees F until start of the cold soak period and decreased to 56 degrees F prior to entry.

Fuel cell performance compared favorably with Apollo IV data and preflight predictions. All fuel cells performed properly after having been stored for approximately two years and after having been operated in an open-circuit condition for an extended time during launch preparations. The fuel cells maintained dc bus voltages between 27.5 and 29.5 throughout the flight. The ac bus voltages were maintained within 114 to 117. The cryogenic system functioned satisfactorily.

Performance of the stabilization and control system and the mission control programmer was nominal throughout the mission.

Recovery forces reported that all drogue and pilot parachute mortars and main parachute disconnects functioned. The main parachutes were sighted in the water, but sank before they could be recovered. The command module was upright when first sighted; however, it may initially have floated upside

down, and then righted itself automatically, since the uprighting bags were deployed. Normally, the bags do not function unless the command module is floating inverted.

All recovery aids were deployed and operating. The high frequency antenna was bent, and the HF signal was weak. However, there are no plans to use the HF recovery beacon on manned flights.

Spacecraft landing point was estimated to be 27°40'N by 157°55'W, about 50 miles from the onboard targeted landing point. Retrieval coordinates were 27°38'N by 158°00'W. Sea conditions were moderate to rough.

Figures on entry heating, lift-to-drag ratio and G forces are not yet available.

Both onboard cameras functioned well. The 70 mm Maurer still camera exposed more than 750 frames and returned exceptional photographs of the earth. The 16 mm Milliken motion picture camera captured the fiery entry into the earth's atmosphere in vivid color. The Milliken camera exposed about 700 feet of film.

Apollo VI Box Score

Event	Planned hr: min:sec	Actual hr:min:sec
Liftoff	6:00:00 am CST	6:00:01.5 CST
S-IC inboard engine cutoff	0:02:24 GET	0:02:25 GET
S-IC outboard engine cutoff	0:02:27	0:02:28
S-II engine ignition	0:02:31	0:02:33
LES jettison	0:03:03	0:03:04
S-II engine 2 shutdown	—	0:06:52
S-II engine 3 shutdown	—	0:06:55
S-II cutoff	0:08:37	0:09:36
S-IVB engine ignition	0:08:41	0:09:40
S-IVB cutoff	0:10:58	0:12:27
(Insertion into 96x196 nm orbit; planned: 101x106 nm)		
Third stage reignition command	03:10:09.4	03:13:35
Third stage engine cutoff command	03:15:36.7	03:13:50
Spacecraft/third stage separation	03:18:38.6	03:14:28.8
SPS ignition	03:20:16.9	03:16:06
SPS cutoff	03:24:30.9	03:23:31
Apogee	06:21:57.5 (12, 019 nm)	06:28:57 (12, 013 nm)
SPS ignition	09:22:13.8	None
SPS cutoff	09:25:22.3	None
CM/SM separation	09:27:54	09:37:05
400,000 feet altitude	09:29:24	09:38:34
Begin blackout	09:29:49	09:38:59
End blackout	09:39:15	09:48:25
Drogue parachute deployment	09:43:34	09:52:44
Main parachute deployment	09:44:23	09:53:24
Landing	09:49:45	09:58:44



CONSOLE CONFAB—Apollo VI Flight Director Clifford Charlesworth, MSC Director of Flight Operations Christopher C. Kraft, Jr. and Apollo VI Mission Director William C. Schneider huddle in the Mission Operations Control Room to discuss alternate missions following failure of the S-IVB stage engine to restart.



AWAITING SPLASH—All eyes are on display screens in the Recovery Control Room as Apollo VI bores into the atmosphere for a landing in the Pacific northwest of Hawaii. From left to right are Col. Royce G. Olson, director of the DOD Manned Spaceflight Support Office at Patrick AFB, Fla., Maj. Gen. Vincent G. Huston, deputy chief of staff-operations, USAF Systems Command, and DOD Manager for Manned Spaceflight Operations, and Jerome B. Hammock, MSC Landing and Recovery Division chief.



COWTOWN AND BIG-D—Fort Worth and Dallas and the North Texas lakes are in wire sharp detail in this photo taken by a 70mm still camera in the cabin of Apollo VI. Runways on Love Field, Dallas Naval Air Station, Ft. Worth International, Carswell AFB and many smaller airports are easily spotted. North is at top of photo.



BAS-RELIEF MOUNTAINS—It was also clear in far West Texas when Apollo VI overflew the El Paso-Juarez area at the crook of the Rio Grande. Lush farmlands stretch northward along the river past Las Cruces. The sun was still low in the east when the photo was taken some three hours after Apollo VI liftoff, and the mountain ranges are in shadow on their west slopes.



CLOUD STREETS—Tidal swamps and offshore islands form the irregular coastline of Georgia as Apollo VI peers down through camera lens. The clouds lie in regular windrows to the northwest as though laid out with a straightedge.



IN-HOUSE VIPs—MSC employees who might otherwise never see the inside of the Mission Control Center during a mission will have reserved seats in the MCC VIP viewing room under a recently begun program for recognition of suggestors, inventors, performance awardees, cost reducers and Manned Flight Awareness nominees. In the first group, getting badged to



sit in on portions of the Apollo VI mission, are (left photo) Robert Plunkett, Clifton Carr, Glory Allahverani, Dr. W. R. Downs and Bldg 30 Security coordinator John R. Jones. In right, photo: Henry W. Flagg, Marion M. Lusk, E. L. Shropshire, Ray Donatto and C. Harold Lambert, Jr.

THE SMOKE OF BATTLE had hardly cleared from the field at San Jacinto before the great debate began: Was Sam Houston a great general? Or was his victory after the long retreat just a piece of sheer luck? Did he mean to fight at all? Or was his eastward march designed to keep out of harm's way and leave a convenient escape hatch open?

These and other hotly debated issues have occupied historians and military strategists for more than a century. One is best equipped to answer for himself after the facts are examined:

When Sam Houston arrived at Gonzales on the afternoon of March 11, 1836, his first inquiry was about the Alamo. Unsupported news had come that the Alamo had fallen on March 6 and all its garrison had been put to the sword.

Houston needed verification. He sent out a scouting party to get close to the Alamo and glean what information it could. Later, to round out that busy first day, Houston dispatched orders to Col. James Fannin at Goliad, directing Fannin to blow up Presidio La Bahia and retreat. By sunset of the 11th, Houston had time to contemplate his "army," some 374 raw and undisciplined troops including a company under command of Capt. Moseley Baker, who had already seen action in 1835 at the Battle of Gonzales and the Grass Fight at the siege of Bexar.

Tragic and definite news of the Alamo's fall reached Gonzales on the morning of March 13. On that day, Mrs. Almaron Dickenson, whose husband had been killed with the rest of the garrison, arrived in town with her daughter. Her report that an enemy column was marching on Gonzales caused immediate panic.

That night, Houston gave the order to evacuate the town. Two cannons were sunk in the Guadalupe River, military stores that could not be taken along were destroyed, and by midnight the little army (still no larger than 400 men) began its long retreat. A few men were left behind, charged with the duty of blowing up ammunition caches and putting Gonzales to the torch.

Through the dismal morning of March 14, the gloomy little band trudged eastward some 11 miles to Peach Creek. There exhausted men threw themselves on the ground and slept beside their weapons. Some reinforcements arrived, but as the army moved out again on the 14th, General Houston surveyed it sadly from a distance, depressed by what he saw. Staring moodily at the thin column, barely visible on the vast prairie, he turned to his adjutant and is reported

to have said: "Hockley, there is the last hope of Texas." He would have occasion to feel even more forlorn before the retreat was ended.

By sunset of March 14, the army had made its way to the Lavaca River. Here it halted for rest and then continued eastward, reaching the Navidad River about one o'clock on the morning of the 15th. While the men rested until morning light, reinforcements from the Brazos arrived. Houston sent to Brazoria for artillery and ammunition, and ordered all troops in that area to join him on the Colorado.

Thus far, Houston's army had followed the main road between Bexar (San Antonio) and San Felipe. On leaving the Navidad, however, Houston ordered his column to turn left and follow the little-used old La Bahia Road, which led to Burnham's Ferry on the Colorado River near present La Grange. Capt. Moseley Baker strongly protested this strategy, but Houston kept his patience and held his tongue.

As a result of the sudden turn-off on the La Bahia Road, the Texan army was by-passed by a pursuing column under General Sesma. From this time on, Houston was always *above*, or north of, the Mexican army. The way for a march to the Sabine and safety in the United States lay open, should he choose to take it.

Burnham's was reached late on March 17. The Texans, who camped that night on the west side of the Colorado, now numbered some 600 men.

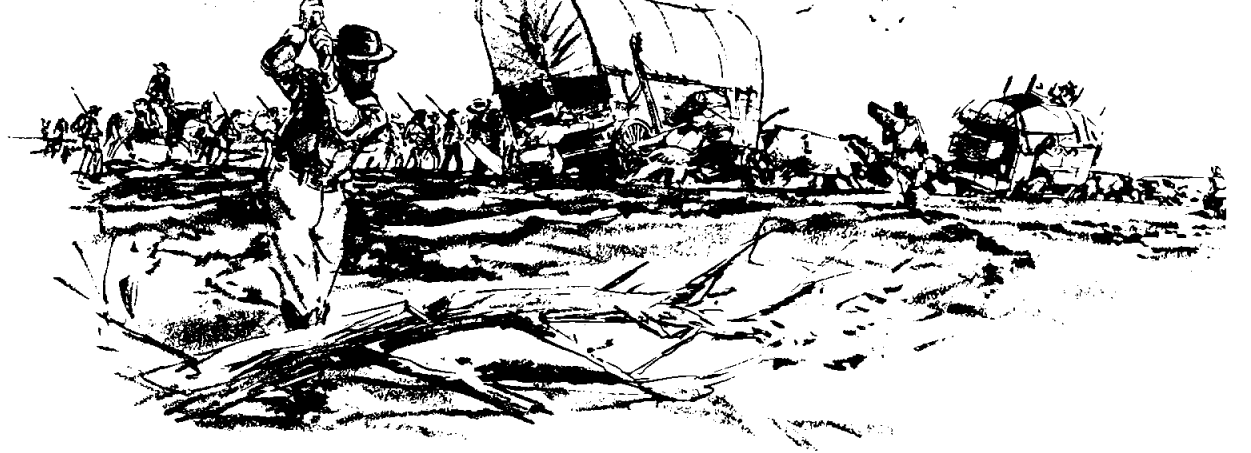
On the 18th, rear guards came up with some of the refugee families that had been clogging the roads leading out of Texas. The famous "Runaway Scrape" had begun. After he ordered these families across the river, Houston received an interesting piece of news.

Santa Anna, Houston now learned, had been undecided after the fall of the Alamo whether to remain in Texas or return to Mexico. Fannin's surrender at Goliad convinced the Mexican commander that the war was over. He arranged to leave for Mexico, making no secret of his plans. Houston did not know that he had changed those plans until April 11, when Joseph Powell brought word from Old Fort (present Richmond) that Santa Anna was on the Brazos.

On March 20, the Texans crossed the Colorado at Burnham's, burning buildings and the ferry itself after they had crossed. Again, Baker protested to no avail.

The Texans now marched down the east side of the Colorado to a point opposite Beason's Ferry, where they made camp. Here they were joined by the

Sam Houston's retreat to victory ended in an 18-minute battle 132 years ago at San Jacinto



The Long Road to San Jacinto

"Liberty Company," some 70 or 80 volunteers from Beaumont and Liberty.

On March 20, scouts brought in a prisoner who yielded valuable information about the movements and strength of the pursuing column under General Sesma. Sesma's position was reported, with the warning that he might appear soon on the other side of the river. On the night of March 22, Sesma camped just a few miles from the Colorado, and on the 23rd, he appeared at the river in force. He was reinforced on the 24th with 675 troops under Tolsa, bringing the enemy's total strength to some 1400 men.

It appeared that Houston was forcing his pursuers to take the lower routes while he took the upper routes. It was sound strategy, furthered by rainy weather that turned prairies into bogs, and brought watercourses to flood-stage throughout lower Texas.

Sesma jockeyed for crossings. Finding the main crossing at Beason's strongly barred, he probed first at Deweese and then at the Atascosita crossing. Both ventures failed. Meanwhile, Houston was reinforced with regular troops under Teal, and with numerous other parties, bringing his force up to about 1200 men.

On March 25, Houston received word of Fannin's defeat and surrender. He suppressed the information, fearing it might affect his troops' morale or precipitate a major conflict prematurely.

On the afternoon of the 26th, after Houston's and Sesma's men had faced each other across the Colorado for three days without a major engagement, Houston gave abrupt orders to break camp. At dusk the Texans withdrew quietly—but left their campfires burning. They marched a good six miles before Houston allowed them to bivouac and "grumble themselves to sleep." At this point, the Texans were again reinforced, bringing their total strength up to about 1400 men.

Daylight of March 27 saw the retreat resumed. By this time, protests against Houston's

leadership and overall strategy grew loud and vocal. Baker made no secret of his feelings: he was for deposing Houston before the day was out! Dark clouds of mutiny hung heavily over the grumbling column. But Houston gave his mutinous men no chance to carry out their ominous threats. He marched them 30 grueling miles that day, and by nightfall they were too tired to care who was in command. They had covered the entire distance between the Colorado and Brazos rivers and pitched camp a mile from San Felipe.

On the morning of March 28, Houston sent units into San Felipe. He had hardly done so when groups of men came to him, loudly insisting that he take them back downriver to fight Sesma. Their demands Houston ignored; their insults he chose not to hear. Then he gave a command that would have made an end of a weak and less determined leader: he called for a march *farther upriver!*

Late on March 28 cold rains added to the general troubles and discomforts. It had been drizzling for hours; the ground was soggy and slick. As the army crossed Mill Creek, the gray skies opened and a cloudburst flooded upon them. Wagons and teams floundered in the morass; some became so mired that Houston and his officers pitched in and worked shoulder-to-shoulder to pry them out. Rain still poured relentlessly that night, but somehow the men got fires going and warmed themselves before cheery blazes.

The next day was spent laboriously hacking a way for wagons through the wild and uninhabited thickets above Mill Creek. It took all day to go three miles. On the 30th, only eight miles were made, with Houston and his men camping near the edge of the Brazos bottom. On the following day, they moved farther into the bottomland to a point near Jared Groce's place on the Brazos. During the past five days, Houston had lost from 400 to 500 men through desertion and special assignment. By the time he reached Groce's, he had no more than 900 troops.

On April 1, Houston selected as the spot for a permanent camp an elevated place in a thick grove of timber circling a clear-water lake. A trail had to be hacked through dense woods and brush, and space had to be cleared to make the campsite ready. Baker later took Houston to task for his choice of a campsite.

No sooner had the Texans gone into camp than the Brazos rose so high, swollen with heavy rains, that it made an island of the campsite. One of Houston's first acts was to commandeering the steamboat "Yellow Stone," then loading cotton at Groce's Landing. Thus he had a means of moving his men quickly across the flooded river, should the occasion demand.

At Groce's, Houston put his army through rigorous drills and reorganized it completely. Sidney Sherman was placed in command of a newly-formed second volunteer regiment. Since Houston expected to receive cannon any day, he organized an artillery company. A medical corps was formed, and a field hospital established on the east side of the Brazos. It took no time at all to fill the new hospital; scores of men suffered from chills, fevers, and exposure.

Meanwhile, those well enough to remain on their feet underwent a thorough course of discipline. Rains poured on them, cold and dismal, drenching them to the skin and doing little to raise dejected spirits. Houston realized, however, the necessity of keeping his men busy.

From Groce's, Houston kept constant watch on the movements of the enemy. Sesma was still having his difficulties at the Atascosita crossing, downriver. Houston, for his part, was poised for mobile action. Though hidden from the enemy, he kept his lines of communication open. In this, he was blessed with as fine a group of scouts as ever served the cause of freedom. "Deaf" Smith, Henry Karnes, and others of their calibre kept Houston well posted. Mexicans serving the Texan Army, such as Capt. Juan N. Seguin, a brilliant and able man, made it possible for Houston to make the most use of captured couriers and their dispatches.

The history of Texas from its earliest exploration through its colonization and growth into a republic, and finally as a state of the Union, is an extremely interesting history. Through the courtesy of Humble Oil and Refining Company, articles from Humble's *Texas Sketchbook* have appeared in the *Roundup* during the past several months. The articles were written by F. T. Fields. Pencil sketches and watercolors accompanying the articles are by the noted Texas artist E. M. "Buck" Schiwetz. This article recounting the battle of San Jacinto 132 years ago this month is the last in the series.

Santa Anna Changes Mind

Santa Anna, having changed his mind about returning to Mexico, decided to leave at once for the front. His strategy was to converge his columns on the Brazos and unite the command there. If that strategy had been accomplished, the total strength of the central column would have been some 3,400 men.

On March 31, *El Presidente* and his staff left Bexar, accompanied by troops under General Vicente Filisola. When they reached Gonzales on April 2, they found a vanguard under Amat held up by floodwaters of the swollen Guadalupe. Impatiently ordering his troops to build barges and cross, Santa Anna and an escort of cavalry swam the Guadalupe and proceeded post-haste to the Colorado. Reaching the Atascosita crossing on April 5, Santa Anna found that Sesma had crossed with his troops, but had left his baggage and artillery behind. Detailing men to build barges and float the material across, Santa Anna took 1200 of Sesma's troops and on April 6 began a march to San Felipe.

On April 7, Santa Anna undertook to cross the Brazos at San Felipe, but found himself turned back by high water and determined resistance from Baker's company. Mexican artillery, rushed up to shell Baker's position roared away without success. An effort to build barges and float across in the face of Texan fire failed miserably. The thwarted Santa Anna quit his struggle at San Felipe on April 9. Taking 500 infantry and 50 cavalry, he went downriver to look for another, less hotly disputed, crossing. Sesma he left behind with the remaining troops.

On April 10, Santa Anna halted for rest and refreshment at the Elizabeth Powell farm. From there, he proceeded to Thompson's Ferry on the Brazos, about three miles above Old Fort. Martin's company defended the opposite side of the river, but his force proved too small to parry several thrusts at crossings in the vicinity. Dispersing his company, Martin and a number of his men started back to rejoin Houston.

On April 11, Santa Anna dispatched orders to Sesma and Filisola, directing them to join him at Thompson's. Sesma arrived on the 13th; Filisola on the 16th. It was at Thompson's that Santa Anna conceived the idea of an attack on Harrisburg. Hearing that the Texan government had taken up headquarters there, he thought it would be a brilliant, back-breaking stroke to capture and hang the whole group. With that in mind, he left for Harrisburg on April 14 with his staff and some 750 men. Sesma was ordered to remain behind with the other troops; Filisola was still marching toward Thompson's.

Houston Moves Out

Houston and his army had remained at Groce's. Here, on April 6, conclusive news of the Fannin massacre reached them. A few stragglers who escaped

the massacre began to filter in, eager to fight again. Though some deserted on hearing the tragic news of Fannin and his men, most of the army was whipped into a frenzy, inflamed with desire for immediate battle. It was difficult to restrain men thus spoiling for a fight, and Houston himself seriously considered giving battle at San Felipe. Counting his sick and ineffectives, faced with wholesale desertions, and mindful of the men on detached duty elsewhere, he decided against a major engagement at that time.

On April 11, Houston got his first conclusive evidence that Santa Anna had not returned to Mexico but was then on the Brazos and preparing to march on Harrisburg. This came from Joseph Powell, who had overheard Mexican discussions while Santa Anna was staying on the Powell farm. Houston suppressed this news, as he had suppressed the first news of the Fannin defeat, for fear of precipitating another panic. He called in Rusk and made plans to move out immediately—but kept the plans a strict secret.

Using the impressed "Yellow Stone," Houston commenced on the morning of April 12 to move his troops across the Brazos. By the following afternoon, all were across, and Houston ordered the gallant crew to steam for their lives down the Brazos and seek safety in the Gulf of Mexico. Fortunately, as it turned out, the "Yellow Stone" made good its escape.

On April 14, the Texans made a night march to a point near present Hempstead. Shortly after, Houston received the cannon he had expected, the famous "Twin Sisters," a gift of the citizens of Cincinnati, crated and billed as "two pieces of hollow ware."

Houston found a number of refugee families camped nearby, and it was not long before the Baker and Martin companies rejoined him. On the morning of April 15, Moses, a servant of Jesse Thompson's, brought to camp an arrogant message from Santa Anna. In it, the self-styled "Napoleon of the West" impudently declared that as soon as he had caught the "land thieves" at Harrisburg he intended to come and smoke Houston out.

It was time for action. Houston prepared to move out at once. His column took the road on the morning of the 16th, but found its way impeded maddeningly by mud and refugee families who straggled along for protection. All of them were bound for the Sabine and safety.

Houston intended to take the road that branched to Harrisburg, but his men were not too sure he did not mean to retreat with others in the "Runaway Scrape." Baker and Martin grumbled, and the army muttered that if it passed the Harrisburg Road, Houston would be deposed and a new leader elected.

Where the roads forked, the Texan column took the road to Harrisburg. Soldiers cheered, but a great wail went up from

the refugees. These he sent on up the Trinity Road, with Martin and his company as escort. Through a quagmire of mud in a beating rain, the main army plodded its way toward Harrisburg.

It was about this time that Dr. N. D. Labadie, a surgeon in Houston's army, missed his medicine cart. It had been drawn by oxen owned by a Mrs. Mann, a refugee. Labadie, going back after the cart, found only its driver, who told him Mrs. Mann had taken her oxen with her up the Trinity Road. Vexed over the loss of oxen, Labadie asked his driver: "How could you give them up?" The fellow replied, logically, "Why, she showed fight when I resisted, presenting her pistol, and then I thought it most prudent to surrender." There was fight in the women, as well as the men, of early Texas.

After a night's rest, Houston resumed the march on April 17. Eighteen miles were made that day before the army halted about six miles north of Harrisburg, where it made camp for the night.

Houston's movements, now more of an advance than a retreat, had been well covered by scouts and spies, chief among them Erastus (Deaf) Smith. On the morning of the 18th, Smith captured and brought in Mexican couriers bearing dispatches for Santa Anna. It was learned from these that the *presidente* was near Lynchburg, on the San Jacinto River, and that Harrisburg had been burned. Labadie says the deerskin saddle-bags carrying the dispatches had belonged to Col. Travis and bore his name.

The Texans now made the six-mile march to Harrisburg. It halted nearby and concealed itself until the morning of the 19th.

Government Escapes

Santa Anna arrived in Harrisburg on April 15th. He found the town abandoned, except for three printers at work. They told him the government had fled to Galveston. Santa Anna immediately put Harrisburg to the torch.

Col. Juan Almonte, with 50 dragoons, reconnoitered Lynchburg and New Washington and reported that Houston was retreating to the Trinity by way of Lynchburg immediately. On the night of April 17, Santa Anna camped at Vince's Bayou and on the following afternoon he marched to New Washington, on Galveston Bay.

Early on the 19th, the Mexican commander sent Capt. Marcos Barragan with dragoons to the Lynchburg crossing to keep a lookout for the Texans. On the morning of the 20th, Barragan reported that Houston was approaching Lynchburg. Santa Anna marched to meet him. The Mexican army arrived at what was to become the San Jacinto battlefield on the 20th, and went into camp. The stage was set for battle.

Houston Leaves Harrisburg

After he reached Harrisburg, Houston sent scouts out toward San Jacinto and Galveston Bay to find Santa Anna and learn, if possible, of his plans. Reports

came that the *presidente* was at New Washington and was expected to go to Anahuac, crossing the San Jacinto at Lynch's Ferry.

Houston then ordered all baggage and his ill and ineffective men to be left at Harrisburg. On the night of the 18th, he and Rusk drew up a call to arms, announcing that the Texan army was "on the eve of battle." Riders were sent out with this proclamation, with instructions to rush to the army all volunteers they might find. On the morning of the 19th, Houston first ordered every man to provide himself with rations enough to last three days. Then he penned a few lines to his friend, Henry Raguet, declaring: "This morning we are in preparation to meet Santa Anna."

Capt. Karnes was ordered to remain with his scouts on the south side of Buffalo Bayou to protect the crossing of the army. About noon on the 19th, the Texans were ready to march. Before he crossed the bayou, Houston addressed his troops briefly: "The army will cross, and we will meet the enemy." By two o'clock on the morning of April 20th, his army was within three miles of Lynch's Ferry, where it halted and slept. A few hours later the army gulped down a hasty breakfast and marched to the ferry. It was then drawn back into a belt of timber so near the ferry that it could block any attempt to cross. The orders were to remain concealed as long as possible; Mexicans did not definitely locate them until two o'clock that afternoon.

Provision for security of retreat was a matter of first concern to Houston after reaching San Jacinto. He thought first to build a floating bridge across Buffalo Bayou. Soldiers, however refused to cooperate, saying they had come to fight; not to build bridges. Nonetheless, Houston quietly had two flatboats floated down the bayou during the night, providing for a measure of security if the battle went against him.

General Cos, obedient to Santa Anna's orders, passed through Harrisburg with about 542 reinforcements on the afternoon of the 20th. If the Texans posted across the stream were detected, the Mexicans ignored them. For their part, following orders, the Texans observed Cos' movements but made no demonstrations as his forces passed. Cos did not join

forces with Santa Anna until the morning of the fateful 21st. After Cos had crossed Vince's Bridge, "Deaf" Smith destroyed it.

With the arrival of Cos on the 21st, Santa Anna's army numbered about 1300 officers and men. Texans had on the field from 920 to 1000 not counting the 350 or so left behind at Harrisburg.

On the afternoon of April 20, Sidney Sherman and a small group of his cavalry engaged in a skirmish with Mexican infantry, and a general battle was almost brought on. In this action, Pvt. Mirabeau B. Lamar so distinguished himself that he was made a cavalry commander the following day.

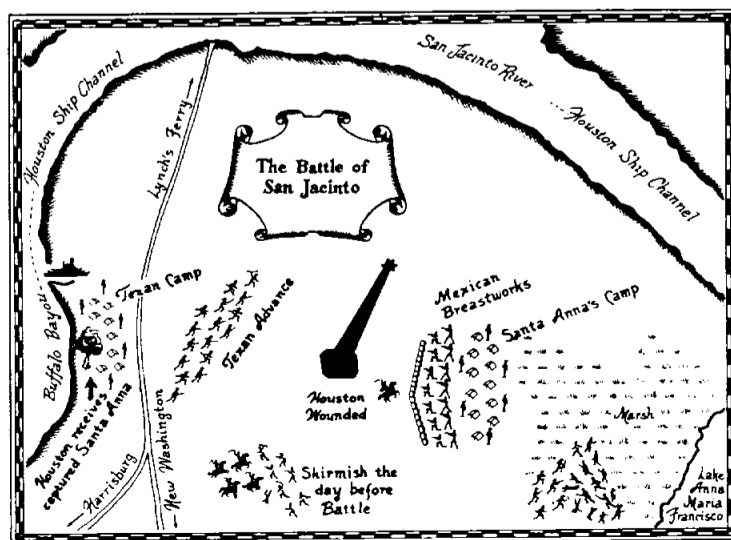
By Thursday morning, April 21, the Texans were eager for attack, but in a forenoon council-of-war, some Texan commanders favored remaining in their camp until attacked by the enemy.

Screening his movements by trees and rising ground, Houston quietly formed his troops in battle array about 3:30 that afternoon. The Mexicans were taking their customary *siesta*, or afternoon rest, and evidently Santa Anna thought it unnecessary to post lookouts.

Suddenly, with wild cries of "Remember the Alamo! Remember Goliad!", the Texans sprang upon the enemy. The battle was over in the incredibly short space of 18 minutes. It was almost unbelievable, but in that short time the Texans had killed 630 of Santa Anna's officers and men, and had taken the remainder prisoner. For their part, the Texans sustained only nine killed or mortally wounded, and only 30 less seriously wounded. Among these was Sam Houston himself, who received a ball in his ankle.

Santa Anna, seeing the battle lost, fled in the disguise of a common soldier. He was captured the following day and brought before Houston after Mexican soldiers had revealed his identity to his captors.

Capturing Santa Anna was a significant stroke for the Texans. Had he made good his escape, it is most likely that he would have reorganized his sizeable forces remaining in Texas and caused further trouble. As it was, he was glad to send orders to those troop commanders, directing them to take their men and leave Texas. Those orders were obeyed and the last threat to peace was removed. Texas was free.



Blood for the Fight Against Leukemia



PLAQUESVILLE—MSC and contractor firms participating in the MSC Blood Deposit Program were recognized by the Leukemia Society of America for having donated 108 pints of blood to the Society during 1967. From left to right are Blood Deposit Program chairman Ed Stelly, distributing plaques, Rita Sommer, MSC; Shirley Kackley, Lockheed; Bill Averyt, Brown & Root-Northrop; Bill Brozowsky, NAR; Maurice Tremblay, GE; Larry Salyers, AT&T, and Al Schneider, Dynalectron. The Boeing Company recently joined the blood program.

CRATERS DUPLICATED—

Ames Scientists Develop Method To Calculate Lunar Soil Depths

Scientists believe they will know the depth of the Moon's topmost layers over much of its surface with reasonable accuracy long before many areas are visited by man or his machines.

Working with Lunar Orbiter and Surveyor photographs and their own laboratory models, NASA Ames Research Center scientists have developed methods of calculating lunar soil depths in most locations on the Moon.

Their research makes it possible to calculate with some confidence the depth of the lunar surface material. It will aid in selection of the sites from which future crewmen will select rock samples.

But even before such samplings are made, researchers hope to prepare detailed lunar geologic maps showing the distribution and depth of fragmental surface materials and hard sub-surface layers. Such a survey would include parts of the Moon that may not be visited for years.

Evidence developed in the experiments indicates that many of the Moon's smaller craters and much of the soil and fragmental material on the lunar surface are the result of meteorite impacts. These conclusions are significant in view of the fact that, although impact origin of

lunar craters has long been assumed, no meteorite impact and no newly formed crater has ever been observed.

The Ames research was based upon measurements made from detailed photographs of most of the Moon's surface by Lunar Orbiters II, III and V and from pictures and surface analyses by four Surveyor spacecraft.

Dr. William Quaide and Verne R. Oberbeck have identified four basic types of lunar impact craters among some 100,000 craters examined. Their findings are presented in a preliminary report recently published in the "Journal of Geophysical Research."

The researchers have simulated meteorite impacts on the Moon in the laboratory. Such experiments have been performed in a high vacuum and under conditions of lunar gravity, approximating one-sixth of that on Earth. Projectiles fired into simulated lunar soil targets produced craters that matched in detail the craters photographed on the Moon.

Of even more significance, a count of numbers versus size of any one of the four crater types in one lunar area can be correlated by laboratory-derived formulas with the numbers and sizes of the other three crater types in the same area.

These findings strongly support the theory of impact origin, because no other natural process could be expected to produce such exact matching.

The four crater types and their relationships have been catalogued:

- For a three-foot layer of fragmental material over a hard

rock surface on the Moon, all craters up to 12 feet in diameter have round bottoms and have depths one quarter of their diameter.

- Craters from 12 to 22 feet across have flat bottoms and a central mound.
- Craters from 22 to 30 feet have flat bottoms and no mound.
- Craters larger than 30 feet in diameter have a second crater gouged in the flat bottom.

Preliminary surveys in three areas of the Moon have shown that the fragmental layer is from one to eight yards thick. Maximum depth calculated by the new method is 20 yards.

Wanted

(Continued from page 7)

Young single girl to share apartment in MSC area. (Preferably Baytown-LaPorte). Bev Hobbs, 422-9910 (Baytown) after 5:15. Will share driving from Alvin to MSC, 7:30-4. Georgie Ann Huepers.

One girl's bicycle 26". D. Ward, 946-7860. Tigerama right half \$1,000. Tigerama left half Firebird. Tigerama left half \$25. Emmie Lamb, 422-2162.

Persons interested in flying a Boeing PT-17 (Stearman) for less than \$10/hr. Dick Grow, 944-1305.

Roommate wanted to share 3 bedroom house near new Foley's on Gulf Freeway. Ray Bruneau, 946-5810.

Tigerama cards: need right half \$1,000 and left half \$100. Will split. John Copeland, 932-2708.

Will share driving or ride. Freeway Manor to MSC. 8 to 4:30. Don Frisbee, 946-7193.

Sewing machine, dryer, self-propelled lawn mower, edger, sailboat. Don Frisbee, 946-7193.

Wanted to Lease: 3 or 4 bedroom house in MSC area. Interested in one year lease minimum, willing to make arrangements beyond a year. Moving to Houston June 15, 1968. W. Carter Alexander, 2713 London Lane, Winston-Salem, North Carolina 27103. Phone 723-5790.

JIM THRIFT SAYS...

GET ON THE BALL



JOIN THE COST REDUCTION TEAM

The Roundup is an official publication of the National Aeronautics and Space Administration Manned Spacecraft Center, Houston, Texas, and is published every other Friday by the Public Affairs Office for MSC employees.

Director Dr. Robert R. Gilruth
Public Affairs Officer Paul Haney
Editor Terry White
Staff Photographer A. "Pat" Patnesky

Pasadena Theater Produces Agatha Christie Whodunit

Agatha Christie's suspenseful murder mystery *Witness for the Prosecution* is the Pasadena Little Theater spring production, and has in its cast and production staff five MSC and contractor employees.

The play revolves around the investigation of the murder of 56-year old widow Emily Jane French. Scotland Yard arrests a young man who stands to inherit the widow's estate—but did he actually do her in? The plot thickens—as most plots do—and the play builds up to an exciting climax and a twist ending.

MSC and contractor employees involved in the play are director Jakey Wood of Administrative Services; Neil Sullivan of the Legal Office, who plays, appropriately enough, barrister Meyers; Doug Burns of Flight Operations Directorate as Inspector Herne; Elisa Salinas Burns of Resources Management Division as jury foreman; and Bob Matteson of Philco-Ford in the dual roles of Mr. Carter and court baliff.

Performances are scheduled each Friday and Saturday night during April. The curtain goes up at 8 pm and tickets at \$2 are available at the door. Reservations can be made by calling the Theater at HU 4-1653. The

Theater is on Tulip Street behind Fedmart on Spencer Highway in Pasadena.

Share Winner

William E. Powell
Acct. No. 3245
won free Credit Union share in semi-monthly drawing

Receives SSP



William Graham
RASPO-Kennedy Space Center

UNDERWRITE YOUR COUNTRY'S MIGHT!
Sign up for U. S. SAVINGS BONDS, FREEDOM SHARES

Roundup Swap-Shop

(Deadline for classified ads is the Friday preceding Roundup publication date. Ads received after the deadline will be run in the next following issue. Send ads in writing to Roundup Editor, AP3. Ads will not be repeated unless requested. Use name and home telephone number.)

FOR SALE/RENT—REAL ESTATE

Well-located one-acre tracts in Friendswood, residential. Good investment. Lee Linson, HU 2-7388.

Five acres of land off Manville Highway on County Road 101. Linda Blankenship, MI 5-0188.

Unusual 4-2-2 in Deer Park, electric kitchen, large paneled family room, formal living room, carpets, drapes, redwood fence. Two extra bedrooms; total 2500 sq. ft. of living area. Equity and assume loan. Total under \$19,000. C. W. Leaverton, GR 9-3759.

5 Bay lots from \$50 to \$100 below regular selling price. Lots located 4 blocks off Highway 146 in Baycliff. J. W. Clepper, RE 3-6473.

Immediate occupancy, 3-2-2 Early American brick in Dickinson, beautifully landscaped, near Freeway for easy access to MSC (15 min), large family room w/cathedral ceiling, formal living room, large master bedroom, laundry, electric kitchen, pantry, large lot, patio w/gas grill, fenced, carpets and drapes, garden house, lot 113 X 82. Harold Atwater, HU 8-3662.

For rent: 3 bedroom home in Dickinson, 1 1/2 bath, double garage, utility room, large back yard and nice neighborhood. \$125 a month. Doris Hetkes, 966-1321.

For sale by owner. 4-2 1/2-2 English style home, living room, dining room, family room, morning room, utility room, all built-in kitchen, large bedrooms, covered patio, redwood fencing, all drapes, cornice boards and carpeting included, El Lago. Harry Day, 877-1152.

1 1/2 acre residential lot. Established community off FM Road 1764 between Gulf Freeway and Alta Loma, 350 ft. frontage on County Road. Harry Day, 877-1152.

Water Front Lot on Caney Creek. One hour from MSC in Pecan Shadows. Brian Wilson, GR 9-4332.

Secluded wooded lot for sale in Dickinson. \$2400. Dwayne Weary, 877-2206.

Dickinson—1 1/2 acre waterfront with private boat slip. High rise, 2 bedroom, 2 years old, furnished, drapes, carpet, paneled, gas built-ins, airconditioners, ready to move in. Very nice throughout. \$14,500. Don White 534-5058 Dickinson after 5, or Jean White, HU 8-0210—Ext. 51.

Home in Nassau Bay, 4-3 1/2-2, unfurnished. Can be rented for 3 months or leased for 1 yr. (\$280 per month plus utilities) Large panel den, formal living and dining rooms, all built-ins; wooded lot overlooking Lake Nassau. 18630 Pt. Lookout Drive. Available immediately. Karl G. Henize, 591-4255.

Rent by day or week, 1 bedroom furnished beach house at Bolivar, with boat slip in front. Evelyn Huvar, HU 3-7626 (no home phone).

Nassau Bay Townhouse for rent, furnished or unfurnished, 2 bedrooms, 1 1/2 bath, washer-dryer, double garage, complete exterior maintenance, pool and club available, shown by appointment. Sullivan, 591-3968.

Fairmont Park, 10315 Belfast Rd., beautiful all brick excellent condition, 3 bedrooms, 2 baths, large paneled den, central air, detached 2 car garage, all electric kitchen, cedar fence, near schools, total price \$22,500, equity. 6% loan. M. P. Frank, GR 1-2848.

3-2-2 Spanish brick, panel den, central air-heat, all electric kitchen, carpet-drapes, 6' cedar fence and gas grill. Equity and assume 6% loan. H. Moore, 932-2471.

2 bedroom, 2 bath all-masonry house on large fenced lot. Frank E. Wittler, Dickinson 534-6623.

Clear Lake City, 3-2-2. Spanish brick, large den and formal living and dining room, assume 5 3/4% conventional plus equity. Rex Dunivent, HU 8-2615 after 5.

By owner, 3 bedrooms, 1 1/2 bath, 2 car garage, large paneled den w/cathedral ceiling, built-ins, large landscaped fenced yard, near schools and new Foley's shopping center. Assume for equity 5 1/4% FHA loan, \$120 per month. Mike Collins, 944-5558 after 5.

FOR SALE—AUTOS

62 Chev. Biscayne. Excellent condition, 6 cyl., 4 dr., radio, heater, air conditioning. Paul Stokholm, Webster, 932-3753.

29 Model A Ford 2-dr. sedan, mechanically sound, body in near excellent condition, runs good. Larry Annin, HU 8-2757 to see.

64 VW sedan, black w/red interior, sunroof, whitewalls, radio, tinted front window, clean, 28,600 miles. \$975. Harold Atwater, HU 8-3662.

65 Rambler Classic, 770 4-door sedan, automatic transmission, air conditioning, new tires, and very clean. \$1350. Robert T. Sloan, HU 8-1027.

65 VW Sunroof w/radio, clean, good tires, new shocks, runs good. Vern Dauphin, HU 2-7355.

59 Chevrolet 4 dr. sedan, equipped with factory air, has good body, motor, tires, battery etc. Dependable transportation for only \$300. C. Garner, RE 3-7517 evenings.

66 VW Square Back. Extra clean, must see to appreciate. \$1775. B. G. Smith, 591-3069.

67 Ford LTD. 18,000 miles full power, air, vinyl top, radio, 4 dr., 390 in autotransmission. \$2650. Ken Kern, 946-8215.

63 Jaguar sedan, 3.8 Mark II, bronze, excellent condition, leather and wood interior, AM-FM radio, 4 speed w/overdrive, low mileage, very reasonably priced. R. Soens, 877-2380.

61 Valiant, 2 dr. hardtop autotrans, radio, heater, good condition, 60,000 actual miles, \$350 cash. Jim Cooper, 944-2680.

60 Ford Starliner, new plugs, points, muffler, excellent tires, 1968 plates, \$325. S. M. Ullman, HU 2-1176 after 5:30 pm.

57 Ford 1/2-ton pickup, exceptionally clean, new engine bearings, heavy-duty springs, \$295. Bill Gatlin, 932-3969.

63 Chevy "Impala" 6-passenger station wagon, excellent condition V-8 automatic, radio/heater air, pwr. steering, pwr. brakes, luggage rack, 4 new white-wall Firestone tires, extra clean car. \$1000. Ben Reina, 488-1326.

66 Dodge Charger, bucket seats, 3 speed automatic with floor mounted shift, air, heater and radio, spinner hub caps, new tires, hidaway head lights. \$2,200. Coy Holloway, GR 9-3894 after 5.

53 Mercury Hardtop w/automatic transmission. Good condition, good tires, new brakes. Peggy Brennan, HU 3-4791 (no home phone).

Good fishing car. 1956 Oldsmobile 88, 4 door sedan, \$100. Emma M. Smith, GR 1-4076.

64 Rambler American 440 hardtop, auto trans, radio, heater, air, new battery and tires. Priced for quick sale due to illness. Carl Grimm, 534-4069 Dickinson.

1964 Dodge Dart—2 dr., GT V-8-stick, radio, heater, 270. \$950. Mel Terry, HU 8-1775.

1967 Volvo 1800S, White-black leather interior, 14,000 miles, mint condition, extra's. Sullivan, 591-3968.

1930 Model A Ford Town Sedan all original. New tires, excellent condition. \$1,500 automobile. Must sell. C. Whitaker, Baytown 424-4245 after 6.

1966 Mustang, one owner, V8 289 Cuff Eng, all-power, air conditioned, stereo tape-radio, black vinyl top, strato bucket seats. \$1800 or \$1000 cash equity and assume MSC Credit Union note. J. L. Gibson, 932-3169 after 5.

51 Ford 2-dr. sedan, flathead six, stick w/overdrive, 95,000 miles, new engine installed at 65,000 miles, runs perfectly, no rust, chrome good, original paint worn thin, needs headliner, good rubber, excellent brakes, R&H work. Must sell—Army calls. \$170 as is; \$200 w/68 plates. J. Stanley, 591-2101.

1966 VW station wagon. (Square Back), extra clean, \$1775. B. G. Smith, 591-3069 (Nassau Bay).

1966 Cadillac convertible, 20,000 miles, new tires, air conditioned, completely equipped. Joyce Anders, 591-2619 or 591-2795.

1967 Ford Galaxie, two-door hardtop, factory air, power steering, radio and heater. Gone to service so must sell. Only 6 months old and in excellent condition. See to appreciate. Joyce Anders, 591-2619 or MI 9-4553 after 5.

65 VW Sunroof, white w/red interior, radio, excellent condition. Vern Dauphin, HU 2-7355.

67 Ford White 1/2 ton pickup, long wheel base-wide bed, air conditioned—4-ply white walls padded seat, headache rack, heavy-duty pipe bumper, radio-heater, 352 V8 std. transmission, gun rack, gauges. \$1900. Billie Patterson, 946-2159.

66 VW, clean, good condition, original owner, 16,000 miles, \$1195. Frank E. Wittler, Dickinson, 534-6623.

Volvo shoulder belts in front. Seat belts in rear. 1959 Chevrolet, air-conditioned station wagon, two doors, H-D whitewall tires, R&H. \$425. B. C. Locher, GR 1-4387.

FOR SALE—MISCELLANEOUS

62 Starcraft Premier, 17 ft. fiberglass, folding seats, 85 hp Mercury (has alternator), trailer, convertible top, two 12-gal. fuel tanks, water ski equipment, extras, excellent condition, \$1250. M. Broussard, 643-1611, after 5:30.

16 ft. fiberglass boat, big two-wheel tilt trailer, 100 horsepower Mercury motor, canopy. MI 5-0188.

4000-BTU Emerson, "Quiet-Kool," window air conditioner. Excellent condition (only used 2 months) \$75. G. E. cooler. Good condition, \$15. J. W. Samouce, HU 8-0406.

Mobile home for lease, furnished, air. Will relocate to your choice area, if on a long-term lease. Reasonable rent. Floyd A. Turner, RE 3-7667.

Solid-oak bookcase headboard, footboard and frame for single bed \$20. Youth bed, rails and mattress \$25. Both beds good condition. Richard Stanton, 932-2982.

1 sofa bed, 1 matching arm chair, 2 blond formica topped end tables, and 1 blond formica coffee table. Excellent for that summer retreat, \$35. A. F. Behrend, HU 7-1298.

Studio couch, beige, \$30. 21" TV, UHF-VHF, \$35. Corner table, blond with glass top, \$15. Corner table, blond with glass top, \$7.50. Chair, green barrel back, \$10. 9 X12 carpet and pad, multi-color, \$25. Zenith stereo with matching side speaker, 40 watts, fruitwood, \$175. Al Buehnell, 932-3515.

New soundtrack stereo recording of "The Graduate." \$3.50. Paid \$4.50. Played once. Mac Jones, HU 8-3976.

Deer Rifle Cal 6.5 X 55mm with 4 X scope and 100 pounds of ammo, \$85 or will trade for S&W K38 or Combat Masterpiece. Kodak Pony 35 mm camera \$10. Youth bed \$15. 1/4-hp electric motor \$3. C. Hopkins, 944-2838.

Knight Deluxe 3-way 12" hi-fi speaker. 35 to 15,000 cps + 3db, impedance 16 ohms. Original cost \$89.50. Knight 20-watt hi-fi amplifier with preamp. Response + 1db. 20-20,000 cps. Distortion 1% at 20 watts. Inputs for magnetic phono, microphone, crystal phono or recorder, and tuner. Output impedance 4, 8, 16 and 500 ohms. Has bad transformer. Original cost \$35.75. Fisher AM/FM tuner, original cost \$275. 21" Silverstone B&W TV. All old but in good working condition with exception of amplifier. Will sell all for \$95. Fruitwood finish Hi-fi components cabinet—excellent condition, \$50. M. Falbo, MI 5-7093.

Bedroom set (dresser, mirror, headboard). Mary Duckett, HU 8-1496.

Long black wig, 100% human hair. \$120 wig will sell for \$60. Veda McCoy, GR 9-3894 after 6.

Kenmore electric range, deluxe model, full size, xclnt condition. \$65. Funk & Wagnalls Encyclopedia, 25 volume set, beautiful green and gold binding \$30. Wonderland of Knowledge Encyclopedia, with all year-books. Most expensive binding. A beautiful set of books. \$40. Myers, GR 9-1023.

Rabbits, Easter bunnies, all ages, sizes and colors. \$1 per month of age. H. F. Kline, ID 3-5190.

Movie projector, Sekonic X60S for both Super 8 and single 8 film, brand new, never used. Main features are the SS-RESONAR zoom lens f/1.4 15-25 mm, automatic threading, built-in automatic pilot light, infinitely variable speed control from 12 to 20 frames per second, forward still and reverse projection, and voltage conversion adjustment for use at nine voltage stages between 100 and 250 VDC. B. Rosenbaum, GR 3-6901.

Motorcycle-250C.C. Suzuki T10 1967, 2500 miles, electric starter, cost \$700 sell \$500. W. E. Thomas, 932-4787.

Westinghouse instant-on Jet-Set 19 inch portable TV set with roll around stand. Monty Taylor, HU 3-4626 (no home phone) Barbi doll clothes, home sewn and reasonably priced. K. Gilbert, 471-1493.

Collie puppies, sable and white, AKC registered, champion line, reasonably priced. Jack H. Dixon, 877-3146.

160 CC Honda Scrambler, 1900 miles, never raced, \$450. 90 CC Honda (S-90), 300 miles, never raced, \$250. New trailer for hauling one, two or three cycles, \$200. El Kuykendall, 591-4096.

Hurst Synco-Loc 3-speed floor shifter. Complete installation kit for '55 thru '64 Chevy's. New condition. \$35 or best offer. Doug Kimbrell, MO 5-1492.

Gold wrought-iron table with champagne glass top and four matching chairs with apple-green leather cushions. Original price \$200. Use 2 mo. Sell \$150. Evelyn Huvar, HU 3-7626 (no home phone).

Fireplace screen with draw drapes, log holder, tools with one extra large log prong holder, all match, and grate. \$50. Evelyn Huvar, HU 3-7626 (no home phone).

Stud Service, male silver blue AKC registered miniature poodle, Evelyn Huvar, HU 3-7626 (no home phone).

16' Helton, 35 hp Johnson, trailer, electric starting, top, lights, compass, misc. other equipment. Good condition-ready to go. \$450. R. R. Stuart, 946-3592.

1967 Suzuki 250 CC. will consider late model O.M.C. or Mercury 5 to 10 hp in trade. E. M. McElwee, GR 4-3476.

Crackerbox welder, 70 amp-115 volt, 10 ft. lead; acetylene welding rig, assorted tips, cutting head, gauges 100 ft. hose, plus dolly for cylinders, \$100. 600 BTU Emerson Quiet Cool Air Conditioner 1967 model, 3-speed thermostat, used 3 months, \$100. Quartermare, black, 6 yrs. old, registered, dogging-type saddle, padded 15" seat, 4" wide stirrups, used for working cows and dogging. \$300. Billie Patterson, 946-2159.

H O Gauge trains RTR, like new, still in original wrappers and boxes. FRT cars \$1, passenger cars RTR (Tyco, AHM, Varney, Athern) \$3. Diesel engines (Tyco, AHM, Varney) \$5, \$6, \$7, \$8 dollars each or sell entire lot. Regular value \$750 for \$500. Mike Bledsoe, GR 1-2600.

Dachshund puppies, seven weeks old, fat, healthy, and lovable. \$25. Paul Weitz, 591-3071.

Late-model Johnson 3 hp outboard motor, excellent condition. \$65. Welby Ward, 946-5182.

19 ft. fiberglass boat, inboard-outboard, V-6 Buick 158 hp engine, 1965 model, depth finder, ski rig, shrimp rig, trailer with power winch, very good condition. John Mullins, 932-4359.

1966 Parkwood 12' by 60" mobile home, 2 bedroom, all wood paneling, beamed ceiling, fully carpeted, central air, very nice, w/10' by 35' screened awning and storage building. H. Mashburn, 649-1369.

Carpets, nylon beige. 13' x 15'—\$90. 7' x 10' for \$15. Excellent condition. J. Hess, 944-0966.

22" Craftsman self-propelled mower, 3 hp including grass-catcher. Ben Reina, HU 8-1326.

Mexico City Olympic Swimming Tickets. I have official certificates that guarantee the right to purchase six reserved seats for each of all 19 Olympic swimming and diving sessions to be held in Mexico City October 17-26. The cost of certificates and tickets per seat per session is about \$13.40 U.S. dollars. Don't reach for your pencil . . . it comes to \$1524.00 U.S. . . . and now you know why we need to get 4-6 families interested. If you are, call Jim Sasser, 591-2336.

Box trailer, 4' x 6' for \$60. F. Hess, 877-2405.

Electric guitar, Hagstrom, like new, two pick-ups and vibrato. Cost \$200—will sell for \$100. A. H. Atkinson, 932-3664.

Lookout tower, \$10. D. Ward, 946-7860. Camera: Minolta Hi-matic 7 with case and haze filter; three years old, excellent condition. New \$110—asking \$60. Oscar Bernard, 487-3697.

21 inch TV, Dumont, with roll around stand, \$25. Al Martin, HU 8-2776 or 591-3951.

Shoulder length, dark brown wig, all one length, hand made. \$50. B. McCarty, 591-2693.

14 foot Larson runabout, complete with 50 HP Mercury Motor, Gator trailer, and some ski equipment, in excellent condition. \$1100. J. A. Fasbrink, HU 8-1130 after 5.

Heavyduty reel-type power lawn mower, \$15. Also 50 feet of wire-bound wooden picket fencing, redwood stain, \$5. J. R. Hartt, 591-2659.

Color TV, 16" Silverstone Consolette. 2 yrs. old. \$150. Hammarlund receiver, BC, SW, HQ140XA \$60 or best offer. Dynakit 60 w. Hifi amp w/preamp. MK111 \$45. Don Frisbee, 946-7193.

21' South Coast sailboat, twin bunk, marine head, cockpit cushions, motor mount, stainless steel standing rigging, dracon main and working jib, all teak trim. All fiber glass with 700 lb. keel, docked at Watergate. \$2750 or best offer. W. Platt, 944-2939 or R. Sutton, GY 7-2460.

21" Motorola console TV, 4 years old, perfect condition, Hi-Fi speaker system built into TV. \$55 or best offer. Dutch, 591-4163.

Dryer-Kelvinator, 3 cycle gas Coppertone 1 1/2 yrs. old. Cost \$170-will take \$110. Very clean. Dutch, 591-4163.

Leica Visoflex II with 4X magnifier \$69. 135mm f/2.8 preset Soligor telephoto lens with Nikon Adapter. \$29. Both new condition. W. C. Vanetsky, 946-9019.

Shetland pony, 4 yr. old gelding, brown and white, gentle, saddle, bridle, blanket, and misc. equipment. \$75. Joe Pirtle, GR 4-2138.

Single-sideband transceiver, SBE-33 Model SF with SBE mobile power supply, mike, whip extension, loading coil and 96-inch fiberglass antenna. \$200. A. C. Capeland, 944-3104 after 5:30.

Side rails for 1967 El Camino. Deluxe styled 7/8-inch stainless tubing with heavy-duty chrome Zamac stanchions. Used one day. \$15. E. E. Quin, MI 3-3620 after 6.

Fly with the non-profit member-run Skyrovers, Inc. based at LaPorte airport, limited to 34 members. Four aircraft: 1 J-3 @ 4.50/hr; 2 Cessna 172s @ \$5.50/hr; 1 Cessna 182 @ 8.50/hr—all prices wet. Dues \$15/month, 1st hour each month free. Dick Grow, 944-1305.

1964 Corvette positraction rear axle assy, complete w/shocks, traction bars etc., \$115. Also Corvette dash assy. w/instr. \$45. Ron Hagood, Texas City. WI 8-2870 after 5.

150-hp Piper Tri-Pacer, new cecanite fuselage, extra nice, sound and clean. Duncan Roland, GR 9-1909.

Airconditioner, GE Thinline, 1 ton, 220 v. \$75. Airconditioner, Westinghouse, 1 ton, 220 v. \$75. Utility fenders, strong but lightweight, \$85. Wall, folding, plastic, heavy duty, 24' x 10' tall, gray, excellent condition, \$75. Siding, aluminum, enough to cover a utility or playhouse, 8" by variable lengths. \$15. Roy Eason, 944-4052.

Viking Ranger transmitter in good physical and electrical condition. \$75. Doug Ward, MI 3-8686.

World-wide stamp collection. 12 to 15 thousand stamps; U.S. used and mint, plate blocks and first day covers. W. G. Pratt, 932-2600 for appointment.

Comanche 250 available to qualified pilots. High speed, long range, IFR equipped. Cover 1000 nm nonstop at 155 knots plus. \$20/hr wet. Will sell 1/3 or 1/4 partnership. Days HU 8-4380, nights 932-3757 or 877-1796.

18 foot boat, 40 hp Evinrude Selectric motor, big-wheel tilt trailer, completely equipped, \$700. Ted Guillory, 472-8208.

Hemisfair '68 family lodging 3 miles from Fair, 1/2 block from bus stop. Large, fully furnished, 2 BR apt. \$15/day. Louis Ponce, 534-4618, Dickinson after 6.

Learn to fly with the Aero Club, Inc. for MSC and contractor employees. Cessna 150: \$7/hr wet; Cessna 172: \$9/hr wet, and K-Bonanza: \$16/hr. Instructor \$5/hr. Only \$50 down, \$11/month, 50% refundable. Bob Ward, 877-3187.

\$50 down, \$11/month, 50% refundable. Bob Ward, 877-3187.

WANTED

Ocilloscope w/CRT, any condition, at give-away price. J. W. Samouce, HU 8-0406.

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Milby High School Class Reunion: The combined graduating classes of 1957 and 1958 are having a 10-year class reunion Friday, April 26, at the Houston Executive Club. For information call either Sally Rosen Crane, 944-2947 or Cathy Paine Sisson, MI 3-9507.

Ride wanted: 4102 S. Shaver (Red Rock Apts) South Houston to MSC. 8 to 4:30 shift. M. Cascaden, 944-9262.

Female roommate to share two bedroom apartment. Someone between 19 and 21, whose husband is in service or overseas and preferably has own bedroom furniture. Pay half of rent. Carolyn Dorch, GR 1-1170.

Used 1-1/2 or 2-ton air conditioners. \$0 to \$100 price range. David F. Bruce, 944-3166.

Want house in MSC area. From owner, 3 or 4 bdr on large wooded lot. Trade equity on house in Houston if desired. H. F. Kline, ID 3-5190 after 5.

Pet coons-will give up to \$7.50 each. Ed Armstrong, 944-0457.

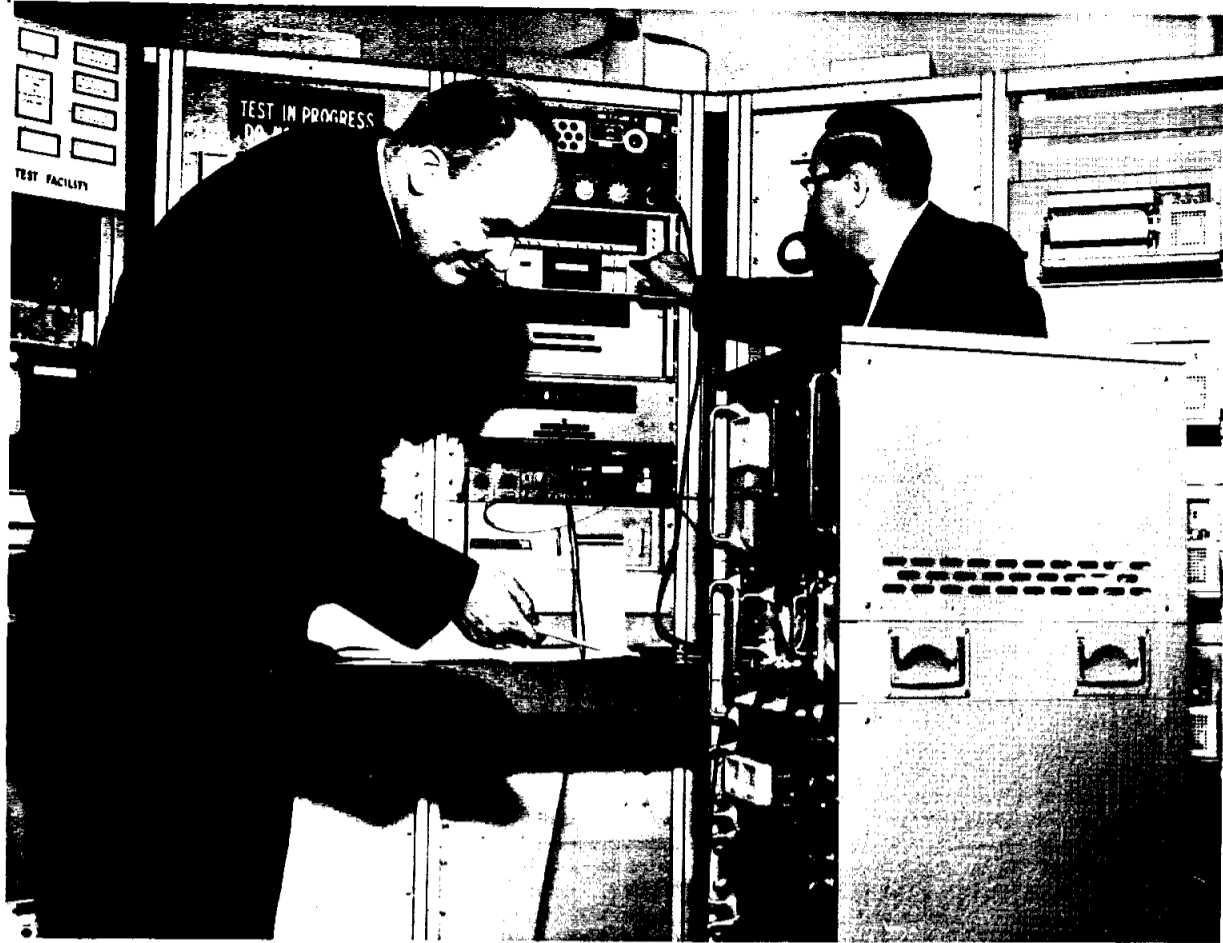
Car pool members wanted from Beverly Hills to Bldgs. 12, 30 or 45, work 8-4:30. Dan Ward, ext. 3216, home 946-7860.

Join or form a car pool from the Gulfway Apartments, 6433 Gulf Freeway, to MSC for the 8-4:30 shift, Monday through Friday. Chuck Denham, ext. 5885.

Want to join car pool from League City Newport addition to Bldg. 2, 8:30 to 5. Leave anytime between 7:15 and 8:15. Gene Krause, 932-3420.

(Continued on page 6)

Not for Pocket or Wrist



HICKORY, DICKORY, ATOM—The Oscillatom, official clock for Hemisfair, March 27 visited MSC for a tete-a-tete with one of Instrumentation and Electronic Systems Division's reference time standards used for testing spacecraft timing systems. Introducing the clocks to each other are Helmut Brandenberger, left, of the Oscilloquartz Department of Ebauches SA, Neuchatel, Switzerland, and David Cree of IESD General Instrumentation Branch. The Oscillatom is driven by oscillation of cesium-133 atoms, while IESD's time standard is driven by an atomic hydrogen maser. Previously synchronized with other time standards around the world, the Oscillatom was synched with the IESD time standard as an academic exercise and the two clocks will be compared after the close of Hemisfair. The Oscillatom's manufacturer claims a precision of one-millionth of a second per day, or one second in 3000 years.

Engineer Heads Off Delivery Delay

Spacecraft 2TV-1 service module arrived at MSC this week with the command module to be delivered soon for a series of manned thermal vacuum tests which will help verify that the Apollo Spacecraft is ready for its first manned flight.

One of the many people who assisted in readying 2TV-1 for its coming test program was Marion Lusk, a systems engineer for MSC's Space Environment Simulation Laboratory. Lusk was recently commended by Apollo Spacecraft Program Manager George Low for a suggestion credited with avoiding a delay of a week or more in the delivery of the test vehicle to MSC.

Lusk was assisting in the final checkout of 2TV-1 at the North American Rockwell facility at Downey, California late in March when a water glycol leak was discovered in a valve seal of the spacecraft environmental control unit. The normal procedure would have been to remove the environmental control unit and repair the seal. This would have caused at least a week's delay.

Lusk suggested cutting out the section of the ECU control panel with the leaking valve, replacing the faulty seal and re-installing the panel section with its repaired valve.

This somewhat unique approach was tried and was proved successful in subsequent testing. William Bergen, President of NR's Space Division, called

attention to Lusk's contribution to the Apollo Program in a letter to Low pointing out that as a result of Lusk's suggestion the leak was repaired and tested the day after it was discovered.

Low offered his personal congratulations to Lusk for what he called "a very significant contribution to the Apollo Program" and one that "is very much appreciated".

MSC Plane Plays Role In Wave-Height Survey

NASA and the US Navy are conducting a feasibility study of using specialized equipment in recording the "sea state" of the North Atlantic.

The survey is being carried out by a NASA aircraft equipped with scientific equipment to determine if the concept of airborne sea state sensing with radar scatterometer is feasible. The aircraft, a converted Lockheed Electra, will be flying over the North Atlantic until mid-April collecting data on the roughness of seas in excess of 15 feet. Previous test missions flown from Newfoundland indicate this equipment is successful in recording seas of 13 feet and less.

This oceanography mission is a portion of the Earth Resources Aircraft Survey Program being performed by MSC. The Spacecraft Oceanographic Project Office of the Navy's Oceanographic Office, New York University and the University of Kansas are working together on this project.

Prime purpose of the mission is to determine if the scientific equipment aboard the aircraft might have a possible space application. Continuous global monitoring of sea state conditions, through a satellite system, might enable safer routing of marine surface vessels.

The survey aircraft is based at Keflavik, Iceland, and will fly within a triangular-shaped area bounded by Keflavik, Iceland, and the oceanographic vessels *Alpha* and *Item*. The *Alpha* is positioned southwest of Keflavik and the *Item* is southeast.

Approximately 20 people from NASA, the Navy and the

two participating Universities will be working on the mission which is scheduled to be completed by April 15. The NASA aircraft is equipped with a radar scatterometer and an assortment of cameras and will fly at an altitude of 10,000 feet at 290 mph approximately 500 nm over the test area.

Data collected during the two-week mission will be returned to MSC where it will be reduced and processed for scientific analysis.

Noted Astronomer Speaks at April 23 Science Seminar

Dr. Carl Sagan, assistant professor of astronomy at Harvard University, will speak on the surface environment and biological prospects on Mars at MSC's monthly science seminar April 23.

Dr. Sagan's major research interests are the physics and chemistry of planetary atmospheres and surfaces, the origin of life on earth and exobiology. He is scheduled to speak at 3:30 pm in the Building I auditorium. The presentation is part of the monthly science seminars sponsored by MSC's Science and Applications Directorate.

Dr. Sagan was an experimenter on the Mariner II Venus mission and is a consultant to NASA and the National Academy of Sciences. He has pioneered in the study of the planets of Mars and Venus and has co-authored *The Atmospheres of Mars and Venus* and *Planets*.

Flight Directors

(Continued from page 1)

the Air Force from February 1955 to December 1958 has been with NASA. He is married to the former Betty Selby of Sherman, Texas, and the couple has three children and reside in Friendswood, Texas. His current assignment at MSC is Chief, Operational Test Branch, Landing and Recovery Division.

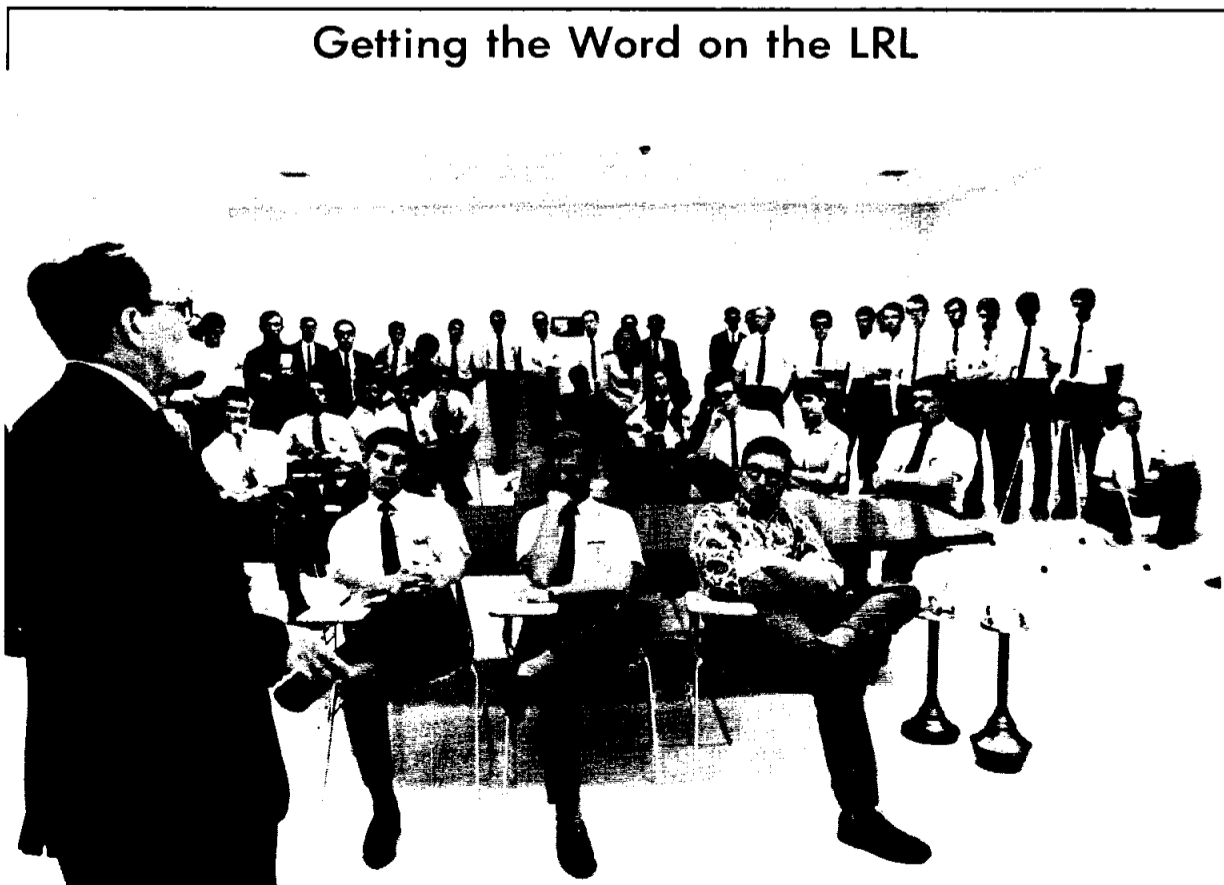
Basic Russian Course Offered

Dr. Mischa Smith of the University of Houston Russian department is conducting a course in elementary Russian each Wednesday from 8 to 10 am at the TRW building on Space Park Drive. The course ends in June and costs \$20.

Smith also announced a planned tour of the Soviet Union at a cost of less than \$1000 a person, leaving Houston July 14 and returning August 4.

To enroll in the course, call Mrs. Joseph Mares at Dickinson 534-4767 or Smith at 747-0428.

Getting the Word on the LRL



CO-OP BRIEFING—Dr. P. R. Bell, chief of the MSC Lunar and Earth Sciences Division and manager of the Lunar Receiving Laboratory, briefs 65 MSC co-op employees on operation of the LRL during the group's visit to the Bldg 37 facility April 3. Following the briefing, the co-ops were broken down into smaller groups for a comprehensive tour of the LRL.