

saturn history
1 / 1966

BOEING

MAGAZINE

SATURN HISTORY DOCUMENT
University of Alabama Research Institute
History of Science & Technology Group
Date ----- Doc. No. -----

X.10



JANUARY 1966

Published monthly in Seattle, Washington by the Public Relations Office.

Editor: CHESTER CHATFIELD

Associate Editor: DARRELL BARTEE (Wichita)

Art and Production Mgr.: KEITH KINSMAN

Staff Artists: ALDEN METCALF,
BILL HARCUS, PHIL VON PHUL



In This Issue

Keep Talking, We Can Hear You . . . 3

Guidelines for Administrators . . . 6

Ambassadors In and Out . . . 8

Game Ole Dame . . . 10

Welding X7106 . . . 11

More West Coast Cities Than Any
Other Airline . . . 12

The Farmer Flies High . . . 14

Solution Seeker . . . 14

Madagascar Mystery . . . 15

PHOTO CREDITS — Byron Wingett (cover); Vern Manion (3, 12); Bjarne Slind (4, 5); Norm Tucker (5); NASA/MSFC, Ray Sparks (6, 7); Experiment in International Living (8, 9); United States Army Aviation Digest (10); Tom Cusick (11); Moulin Studios (12); Vern Rutledge (12, 13, 14); Paul Wagner (14); Roger LeBras (15).



ON OUR COVER this month is the second production Boeing 727 jetliner, now concluding its second year as a test airplane used exclusively for development, demonstration and training. The airplane is shown taxiing on Boeing Field, Seattle, after a flight.

THE **BOEING** COMPANY

HEADQUARTERS OFFICES

7755 East Marginal Way, Seattle, Washington 98124



S The Missile Division was renamed last month as the Missile and Information Systems Division. It is headed by Robert H. Jewett, a Boeing vice-president, as general manager. E. H. Boullioun, a Boeing vice-president, was appointed assistant general manager of the Commercial Airplane Division. Thoralf E. Gamlem, a Boeing vice-president, became manager of Central Fabrication, a new manufacturing organization in the Seattle area.

S Airlines ordering Boeing jetliners in recent weeks included Pan American World Airways, nine additional 707 Intercontinentals; Sabena Belgian World Airlines, one additional 707-320C; Caledonian Airways, Scotland, one 707-320C, and Air India, two 707-320s.

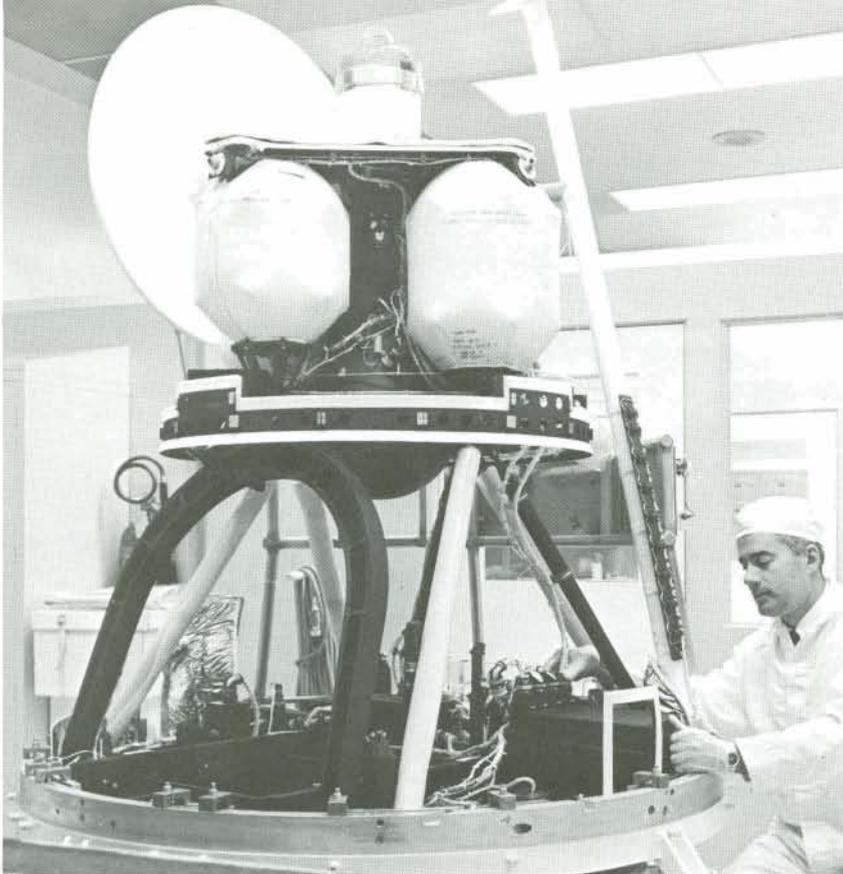
S Construction of additional manufacturing facilities is proceeding rapidly to meet the large demand for Boeing jetliners. A new final assembly building will add more than 15 acres under one roof. Also under construction is a two-story office building. Both buildings are going up at Renton adjacent to established office and manufacturing areas.

S Record trips around the world are a habit of Boeing airplanes. The most recent achievement of this kind was made by a 707-320C owned by the Flying Tiger Line and sponsored by the Rockwell Standard Corp. which carried 40 persons in a loop passing over the North Pole and the South Pole, November 14 to 17, 1965. The Boeing B-50A, *Lucky Lady II*, made the first non-stop flight around the world February 26 to March 2, 1949, being refueled by KB-29 tankers en route. Between January 15 and 18, 1957, three B-52 bombers, refueled in flight by KC-97 aerial tankers, made a non-stop 24,325-mile loop.

S Four awards for technological developments were made to Boeing last month in the 1965 competition sponsored by *Industrial Research* magazine. Details of the developments were reported in previous issues of *Boeing Magazine*.

S *Flying Fortress* by Edward Jablonski is an impressive new book (more than 400 illustrations) which tells the story of the Boeing B-17 bomber in World War II. Sometimes funny, sometimes tragic, this is a fascinating history. Doubleday & Co., Inc., Garden City, New York, \$6.95.





First Lunar Orbiter spacecraft leaves Seattle cleanroom.

250,000 miles away but still within earshot—

KEEP TALKING, WE CAN HEAR YOU

By WILLIAM JURY

THREE huge hearing aids with which man can eavesdrop on faraway electronic gossip will attempt to track an 850-pound speck in space this year.

The listening devices are dish-shaped 85-foot antennas. Built to transmit as well as receive electrical signals, they can track spacecraft long after the spacecraft has passed from sight of optical telescopes. They are part of the worldwide Deep Space Network.

The speck will be an unmanned Lunar Orbiter, hurled into space this summer from Cape Kennedy. If the shot is true—and if delicate post-launch maneuvers are successful—the craft will go into an orbit around the moon.

As the craft orbits the moon, antennas at three Deep Space Stations will be listening for signals which, when sorted out from static, will lead to the sharpest, most detailed photos of the moon's surface ever obtained.

The photos, transmitted as radio signals by the Boeing-built spacecraft, will help scientists select safe landing sites for Apollo astronauts.

The three stations assigned to the Lunar Orbiter mission are so spaced that at least one always is in touch with the moon. One listening post has been built in the rolling hills of Central Spain, about 30 miles from Madrid. A second is located 120 degrees to the east—at Woomera—between dry salt lakes on the fringe of Australia's Great Victoria Desert. The other—Goldstone,

45 miles north of Barstow, California, near the center of the Mojave Desert—is almost precisely a third of the world away from the others.

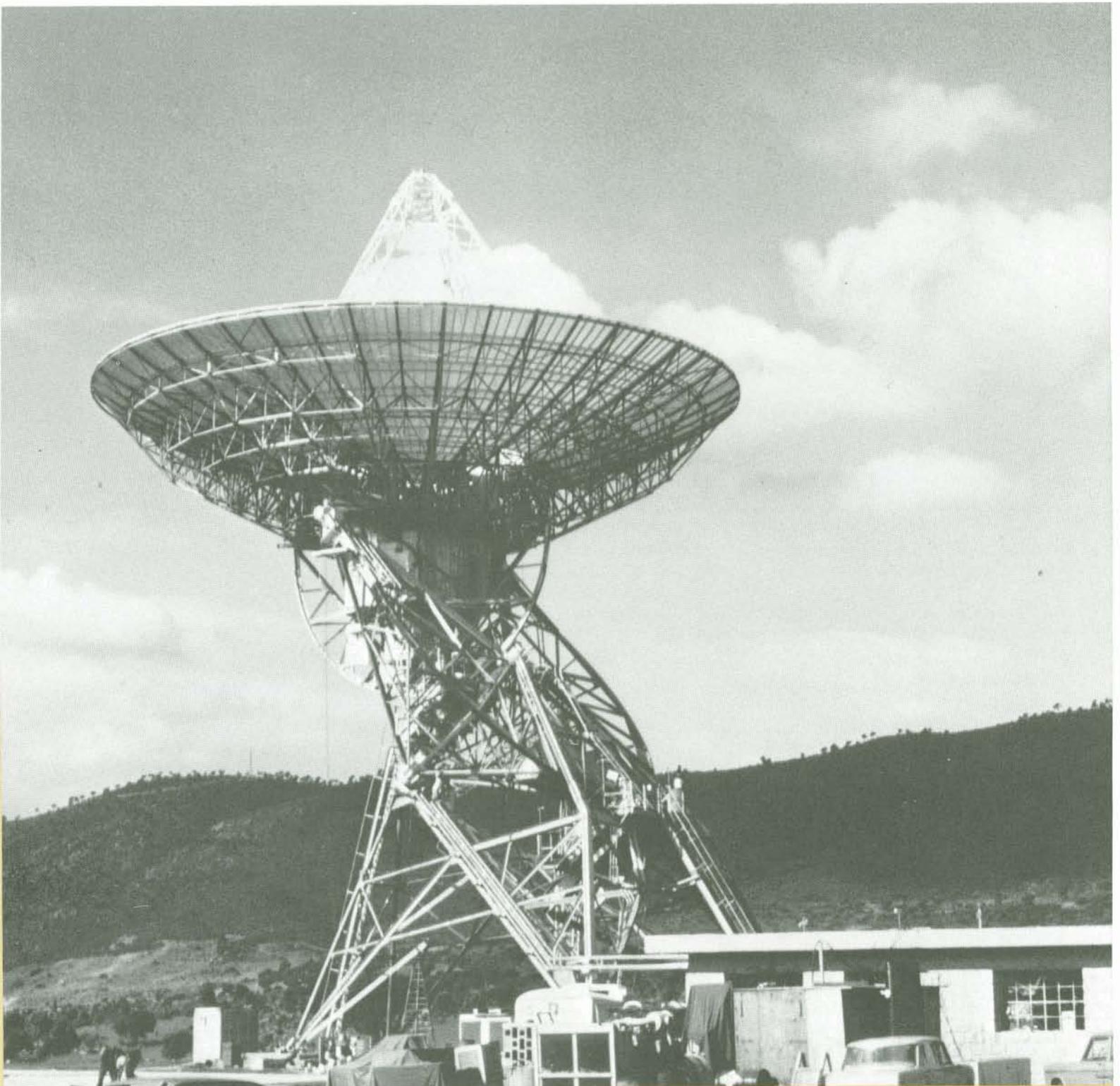
When the Lunar Orbiter shucks its booster, control of the mission will be transferred from Air Force Eastern Test Range in Florida to Space Flight Operations Facility at Pasadena, California. There, in a bright new facility backed up against the San Gabriel Mountains, a group of Boeing engineers will take over the mission and begin computing trajectories for the spacecraft and generating commands—from 1500 to 3000 of them, compared with about a dozen for a Ranger spacecraft.

Boeing, which is building eight Lunar Orbiters for the National Aeronautics and Space Administration, is the first industrial contractor to be assigned major space flight mission operations responsibilities on a project in which it is participating. The company will have about 90 persons at SFOF under terms of a contract with NASA's Langley Research Center, manager of the Lunar Orbiter program.

Small groups of Boeing engineers have been at Madrid, Woomera and Goldstone since last fall installing and checking out Lunar Orbiter equipment. Each group will be joined by 10 more men prior to launch to support the mission.

After Jet Propulsion Laboratory facilities pinpoint the Orbiter in space, tracking information will be fed into computers at Space Flight Operations Facility. Boeing engineers at computers, consoles and other data stations will monitor mission progress and spacecraft performance—checking power, communications, the Orbiter's attitude, temperatures on board and the like.

Commands from Pasadena will be fed to the Deep Space Stations via high-speed teletype. Arriving in a code that will be foreign to the Lunar Orbiter, the commands will have to be converted at the stations to a language the Orbiter can understand. Engineers will monitor this "translation" and then transmit it to the spacecraft. But they still will want it verified, and tens of thousands of miles out in space, the Orbiter will obediently return the signal. If it checks out, the Orbiter will



Using antennas designed to detect faintest radio signals, man can obtain photographs from space. This 85-foot antenna towers over Madrid station.



Spanish stonemasons built Madrid station's buildings.



Pet tarantula is home at Goldstone.

be told to commit the command to memory, to be drawn upon later. Enough commands can be stored to control the spacecraft for 16 hours.

If the Orbiter strays from its course, tracking data will detect it. From Pasadena, a signal for a mid-course correction will go out via one of the big dish antennas in contact with the speck in space.

As it approaches the moon, the Lunar Orbiter will be steered into a wide egg-shaped orbit around earth's pock-marked satellite. It will stay in this orbit until engineers have plotted the craft's course and behavior, and until the moon's size and gravity have been determined.

Then the most critical command of all must be flashed across a quarter of a million miles of space to the unmanned spacecraft: tighten up the orbit and drop to within 28 miles of the moon. The response must be just enough to slow the spacecraft so the moon's gravity can pull Orbiter down to pass at a precise altitude exactly over the areas selected for photography.

As he presses the button to send the command, the space flight operations director at Pasadena will share for a fleeting moment the lonely responsibility felt by William Tell when he released the bowstring.

The exposed film will be proc-

essed on board to produce a high-quality photo negative. The negative will be scanned by a tiny beam of light. The light passing through the negative will be converted into electrical signals and transmitted to earth. At the Deep Space Stations the electronic signals will be converted back into light and the image recorded on film. This film record then will be processed and the pictures reassembled into a reconstruction of what the camera saw.

The Deep Space Network will be able to monitor the spacecraft throughout its flight (except when it passes behind the moon), but because of the earth's rotation each Deep Space Station will be able to collect only a portion of the information gathered during the mission. Tracking, telemetry and photographic data will be consolidated at a central data processing lab.

The antenna which towers over each of the three stations is only one of the common threads tying the widely separated outposts together. Each of the listening posts was built in a shallow basin to take advantage of the natural protection from earth-generated "noise."

Woomera is known as Australia's "most up-to-date town," but the community's water must come from 400 miles away. Much closer, and a

startling contrast to the elaborate trappings of the Space Age, are the aborigines whose crude drawings are scratched on rocks only 20 miles from Woomera. Other oddities: kangaroos and 120-degree temperatures at Christmas.

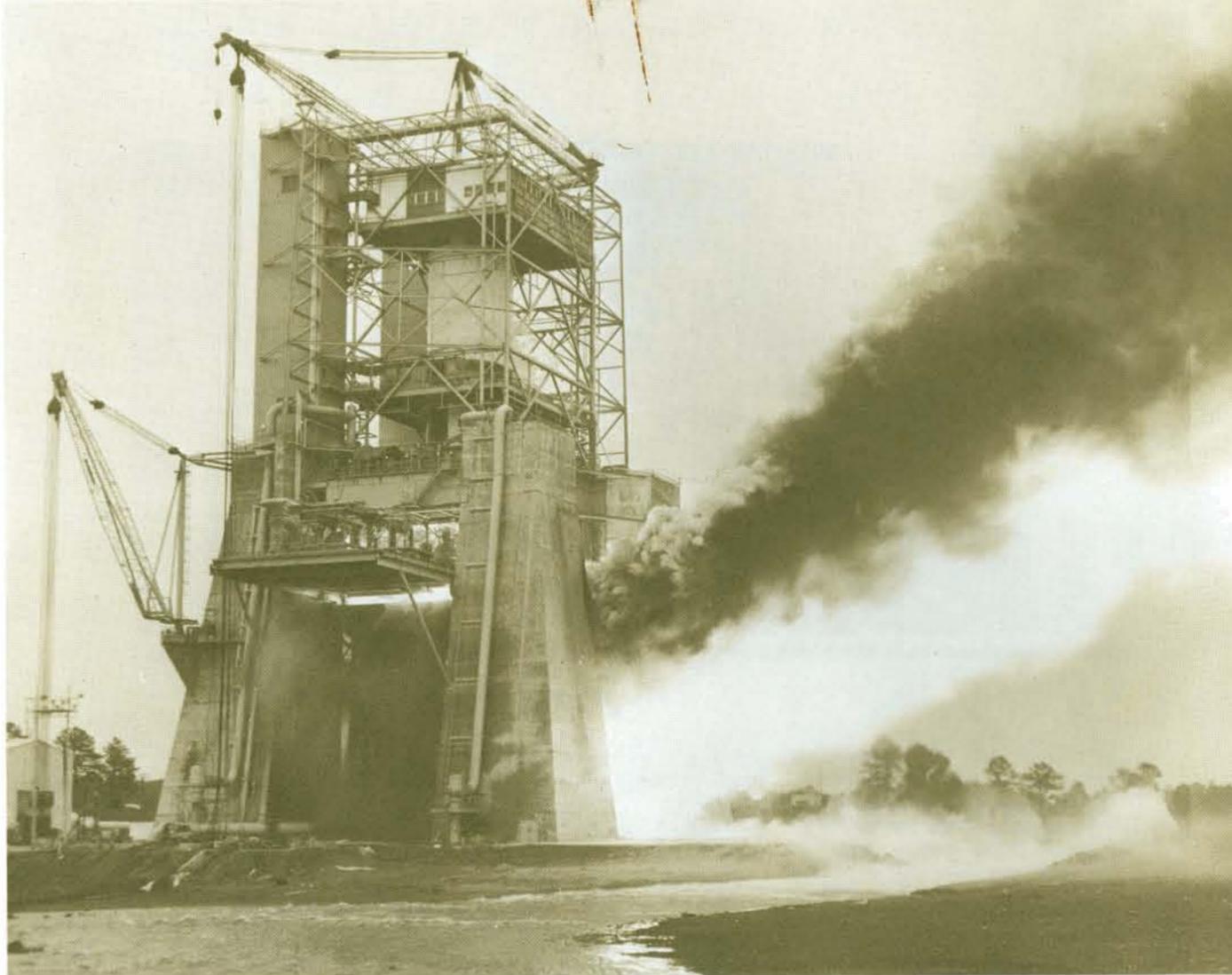
There are no kangaroos at California's Goldstone station, but there are tarantulas, scorpions, sidewinders, coyotes, desert turtles and jack rabbits. There also is sunshine and very little rain, a situation that some Boeing families recently transplanted from the Pacific Northwest find novel indeed.

Without doubt, the prize plum is the Madrid assignment. Its climate compares with California's southern coast. Families of Boeing engineers assigned to the Madrid station live in the city, Western Europe's third largest.

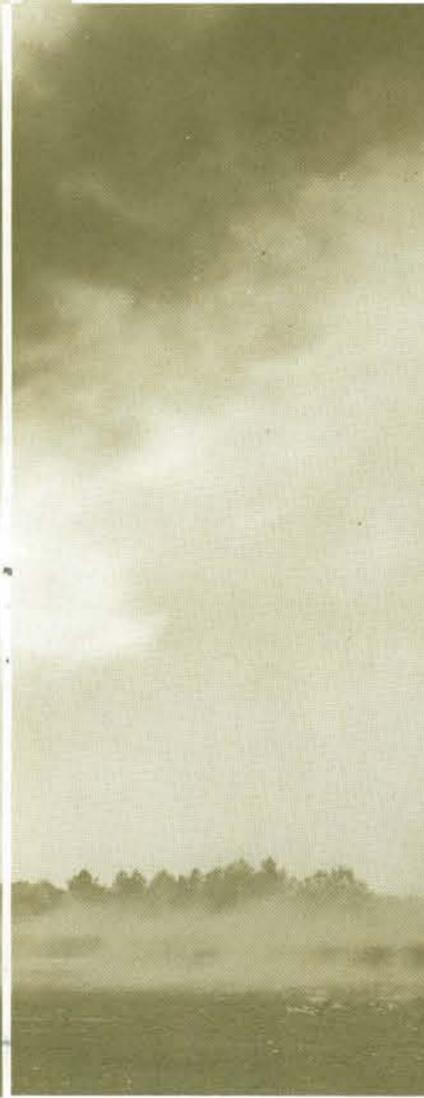
Spanish workmen built the stone buildings which house the men and equipment. Granite blocks, mined from a nearby quarry, were cut with sledgehammers and chisels. Pieces were fitted into place.

Government specifications called for mortar between the blocks, so mortar was added, but over the vigorous protests of the Spanish stonemasons who wouldn't be caught dead using the sticky kid stuff.

"They did a beautiful job," said an admiring Boeing man. 



Test firings of Saturn V S-IC booster are major points on Control Center charts.



Huntsville test stands hold F-1 engine (left) and S-IC booster (right). Dynamic Test Stand is in center background.

A Control chart is checked by (from left) B. F. Beckelman, Dr. Arthur L. Rudolph, Bill H. Sneed and R. H. Nelson.



Marshall's Saturn V Moon Mission Control Center provides

GUIDELINES FOR ADMINISTRATORS

By WILLIAM SHEIL

ONE of the more difficult tasks of the space age is the business of maintaining current status on the many sets of facts related to Apollo/Saturn V program progress.

At the National Aeronautics and Space Administration's Marshall Space Flight Center in Huntsville, Alabama, management executives have a unique Saturn V Moon Mission Program Control Center which

provides maximum visibility for thousands of bits of information which reflect the daily pulse of the multi-million-dollar project.

The Center permits program officials to maintain pinpoint control of activities of more than 100,000 persons representing 13,500 companies in 47 states who are working toward the national goal of landing American astronauts on the moon in this decade.

The Boeing Launch Systems

Branch in Huntsville, as part of its role as a major mission support contractor to Marshall, assisted the Saturn V program office in establishing the Center last year. Employing many of the techniques used on the Air Force Minuteman program, Boeing assisted in developing a 3,000-square-foot display area which provides program guidelines in simple, succinct style.

Key management, financial, schedule and technical data is post-

ed in the Center. Stage and functional staff managers are responsible for assessing and providing current data for posting status of their respective program phases, so that a current picture of Saturn V progress and problem areas is visible at all times.

The unpretentious Center features the latest data-display techniques, including rear-projection equipment for two screens, for slides and motion pictures. A closed-circuit television system is being installed to provide a direct audio/visual link with the Kennedy Space Center Launch Complex during countdown and launch operations.

Across the rear of the room is a large Program Evaluation Review Technique (PERT) network board.

This chart summarizes into 800 significant entries some 90,000 key events taking place on the entire program. The PERT network, unlike milestone charts, recognizes progress which must be made in one task before subsequent tasks can begin. A schedule of activities and their points of interaction is essential to the system. The basic PERT technique is flexible enough to include a variety of objectives and applications which help managers evaluate program status.

When NASA Administrator James Webb toured the Saturn V Moon Mission Program Control Center last summer he said: "The management system here is a tremendous advance . . . it's the best I have ever seen." Webb's comment was partic-

ularly gratifying to Dr. Arthur L. Rudolph, Marshall's Saturn V program manager, and Don H. Atherly, Saturn V program executive for Boeing.

Rudolph, who has been associated with rocketry since 1930, manages all phases of the Saturn V project through planning, coordination and contractor technical direction. Atherly joined Boeing 10 years ago and has held a number of management positions with the company.

"The Control Center," Rudolph says, "is the heart of our operation. Interfaces between all of the contractors, subcontractors and NASA require the most advanced management systems available. We must have the handle on the package at all times, and thanks to PERT and the other visibility aids we are achieving this objective."

The Center is used for daily and weekly program review meetings with project and staff officials. Dr. Rudolph holds monthly manager meetings here. Many other government officials are often briefed in this room. It is a working center used entirely as a Saturn V management tool.

The Saturn program, encompassing Saturn I, I-B and V, is run by Edmund F. O'Connor, brigadier general, United States Air Force, on special assignment to NASA. Both O'Connor and Rudolph, as well as Marshall Center Director Dr. Wernher von Braun, make extensive use of the room.

Distinguished guests to the Center during 1965 included: Charles Schultz, director, Bureau of the Budget; Dr. George Mueller, NASA associate administrator for manned space flight; Dr. Robert Seamans, NASA deputy administrator, and General Samuel Phillips, Apollo program director, who formerly headed the Air Force Minuteman program.

As America moves closer to sending men to the moon (and beyond it in Project Apollo) the effort already has become the largest single industrial program in the world. The Program Control Center tells what is happening every day. ←

Pan American 707 aids Experiment in International Living.

AMBASSADORS IN AND OUT

By CAPT. N. N. TAMPOSI
Pan American World Airways

WE HAVE SPENT an interesting week with N408 PA, Boeing 707 Intercontinental. Mechanically, day and night, in all kinds of weather, our ship performed smoothly, powerfully and without a hitch anywhere along the line, to India and back. Enroute from New York City, stops were scheduled at Shannon, Athens, Istanbul, Tehran, Karachi, and New Delhi, east and westbound.

Ever since it was hatched at the Boeing complex in Seattle, 408 has performed a useful service having carried thousands of passengers to all continents, time and again. For all her fine past performances, my crew and I like to think, in a figurative sense at least, that our ship never soared with such magnanimity, or higher purpose, than on our trip this week.

Eastbound, we carried some 150 young people back to their native lands after having lived in the U.S. for about two months. Westbound, we carried a like number of young Americans who lived abroad during the same period. This charter flight is but one of several that have been arranged by an organization called "Experiment in International Living," with headquarters in Putney, Vermont, and branch offices all over the world.

Through this organization, arrangements are made whereby young Americans spend two summer months as guests of families abroad, while young citizens from other nations spend a concurrent period living with American families in the United States. The regions of residence are not confined to the capital centers, but wide-

spread across hamlets, villages, towns and cities, here and overseas.

Most of these people were in their late teens, early or mid-twenties. Most were university undergraduates, some were doing graduate work, some were teachers. Most of them were paying their own way, some were subsidized by earning scholarships. The basic scope of "Experiment in International Living" is to better the human relationships between peoples of the world. Should the overflowing exuberance and enthusiasm of our returning passengers, eastward and westward, serve as an indicator of good will, this program, then, is simply an outstanding success.

In a manner of speaking, one hears of novel ideas every day, a few have the soundness to merit a second thought. This one, I believe, is deserving of much thought.

During the course of our eastbound trip, at stopovers and aloft, my crew and I were pleased to hear from our visiting young friends, over and over again, strong and favorable impressions gained of the United States. Typical was a young lady doctor from India who came to our country with many misgivings; all such notions were quickly dispelled after moving into the home of a family from Philadelphia.

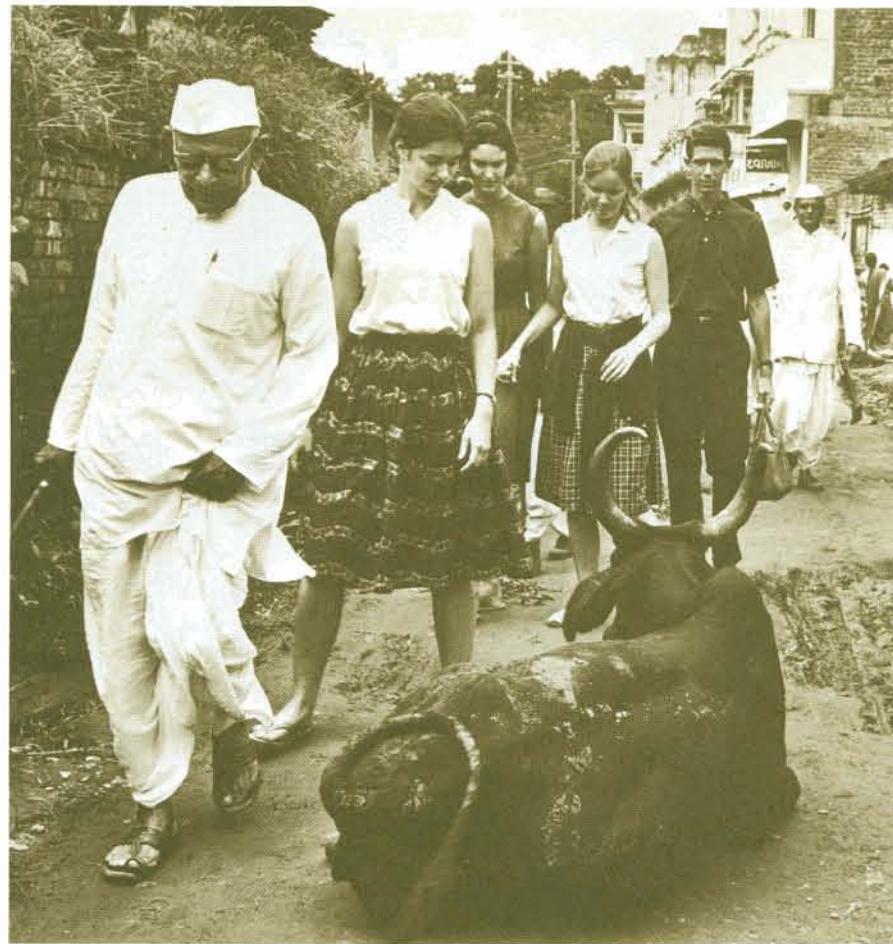
A young student from Tehran found that Americans were not positively cold, rude, uncouth, or predisposed to bellicosity. A young lady from Germany, living with a family in Kentucky, said, "All I've read wasn't true. I hope I can return." A boy from Turkey said, "I like the U.S. much more now."

What we found to be equally gratifying was the favorable impressions expressed by young Americans on their homeward-bound flight. We



Young American Experimenter gets grass-roots knowledge of India.

Capt. N. N. Tamposi



Experimenters see things strange to them in Bangalore.

Group of Experimenters boards 707 at Athens, Greece.



landed at Athens in the pre-dawn hours on Sunday. In the brightness of the terminal there, they all tried to outdo each other in telling of their wonderful experiences.

Beneath all their gregariousness, their levity and their exuberance, one sensed a deeper seriousness in our youth. It has been said, over and over again, that if one ever wants the solutions to world problems—"Just ask any freshman, he will have the right answers." Be that as it may, he deserves an "A" for effort.

A young college girl from Weston, Massachusetts, dressed in East Indian garb, said the family she lived with were simply marvelous people. A boy from Oklahoma said that ignorance, fear, suspicion and hate were partners destined to fall. A young lady popped up and added that her uncle back in Ohio was a pompous dumbo, and she could hardly wait to get back and deflate him flat. A teacher from Brooklyn, visiting Israel, said, "What a country! It is true, one view is better than 1,000 words."

Enroute, these American kids slept not a wink. They were exchanging views, taking notes, or pointing at the Isle of Capri, Rome, Genoa, Elba, Monaco, Mount Blanc, Lyon, Normandy, cloud configuration, or the rugged south Irish coast. They asked about our 707, or where we were; they didn't want to miss a thing.

Going home east, or coming home west, these young kids inspired the crew by their objectiveness, their optimism, their hopes and desires for more light, for a better tomorrow.

As for the crew, it was a privilege, because jet clipper 408 never carried a better load, eastbound or westbound.

In Vietnam the Boeing Vertol H-21 was called the

GAME OLE DAME

By MAJ. MILTON P. CHERNE
United States Army

SMOKE and fire belched forth as the engine roared to life with deafening reverberations. Minutes later, the first CH-21 made her ungainly debut before the Vietnamese audience that thronged around the baby flattop anchored at the base of Tu Duo Street in Saigon.

Awkwardly, perhaps clumsily, she hovered momentarily over the crowded carrier deck as the pilot talked to her in soothing tones before coaxing her into a downwind overwater takeoff. With the frivolity of a teenager, she shed her ungainliness and changed into a thing of grace as she ascended into flight. The crowd cheered with glee and admiration as the banana-shaped helicopter circled the city, asserting her reign and dominance over the countryside. The skies were hers, and hers alone. Jealous, temperamental, fickle, understanding, mean, ornery, and hardheaded she was. But she liked to be treated like a lady.

That was four years ago. Since then she has been used and abused, cussed and discussed, but never has she been ignored. We pampered and pleaded with the ole gal and sometimes seemed to lift her into the air with sheer will power. She shuddered and vibrated to let us know that this work wasn't appreciated, but she knew the job had to be done—and do it she did.

Pigs, chickens, dogs, women and suckling babes have swelled her innards. Iceboxes, rice, lumber, plumbing, wire and an endless list of items have been speedily transported across the land. Guns, mortars, and men were her primary interest, and when they riddled her with bullets, she gallantly continued on.

Occasionally the strain would be too much and our lady would rebel. Like a Missouri mule, she just quit doing what she was doing and really didn't care where she was. This seasoned many a young pilot and greyed a few more. Once in a while she would roll over on her side and thrash her blades on the ground like a child having a tantrum. We'd pull and tug to get her on her feet and

with tender loving care feed her a new engine, a shiny transmission or two, and bribe her with the thought of six new blades to take her into the air again.

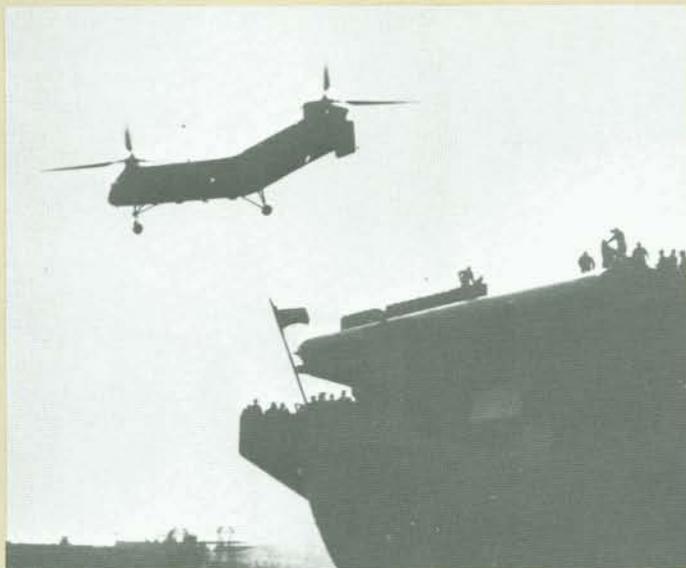
As her hair became white and her muscles became knotted and sore, she wisely noted the young upstarts were doing more and more. They were trim and sleek while she was patched and old. Her memories were vivid and she could recall the legion of firm hands that had guided her history. This game ole dame had pioneered a new frontier. Sadly, she recalled the valiant young men who had given their all. Proudly, she could point to her accomplishments and the dedicated men who have ridden her to glory.

Recently, the last of her kind retired. Ironically, Lt. Col. Robert Dillard, who introduced the lady to Vietnam in December 1961, flew one of the original CH-21s (old 049) on her last flight. He brought her down from her unit and prepared her for shipment home. The excitement and confusion of her arrival will be missing. No doubt, no one will wave and cheer as she leaves. But we all will have a sadness in our hearts as we bid farewell to a dear old lady that has taught us so much and worked so untiringly.

Reprinted from the United States Army Aviation Digest.

First Boeing Vertol H-21 helicopter to head for action in Vietnam was unloaded at Saigon December 11, 1961.

United States Army helicopter units flying H-21s carried many troops to battle.



*A process
is being developed for*

WELDING X7106

By DARRELL BARTEE

A NEW procedure for adding strength to the massive joints of large space vehicles is making use of improved aluminum alloys. The Wichita Branch experimental project calls for welding together two half-circle components each weighing more than a ton into a ring 16 feet in diameter.

The two sections are the largest to be developed to date from a new X7106 aluminum alloy, according to Alcoa, the raw material supplier. Joining is being accomplished with a new welding material aided by Boeing techniques in pre-heating, cooling, aging, and testing.

The work is being done under contract in support of the National Aeronautics and Space Administration's launch vehicle configuration research program at the Marshall Space Flight Center. When welding is completed, the cross section of the experimental ring will be machined into a "Y" shape similar to the configuration frequently used in joining space booster fuel-tank structures. In this special case the rings are for a novel semi-toroidal tank shape, which is undergoing structural and manufacturing feasibility development at Marshall.

The ring-section ends being joined are 4.5 inches thick and 14.5 inches wide. Edges are beveled so that when they are butted together weld grooves are formed in the shape of a modified U.

Important in the process is the temperature difference between melted alloy and parts being joined. To deal with this, Wichita technicians have attached electrical resistance-type heaters near the grooves. These reduce thermal shock

by maintaining slightly elevated temperatures during welding.

The special welding filler alloy is a new one called X-5180, also developed by Alcoa. It is applied in a gradual build-up to prevent distortion during cooling. Alternate welding and cooling periods are precisely controlled.

Holding fixture for the ring has the form of a wheel positioned vertically with a free-turning hub at the center. This allows the welders to work at all four grooves while looking downward.

As the build-up of the alloy layers is continued, ineffective parts of melted materials are carefully chipped away, so that a completely solid joint is achieved. The weld is then checked by X-ray. Final step is a post-weld process which Boeing does under Alcoa license. Indications are that the research, guided at Wichita by the manufacturing development section, is contributing substantially to techniques for welding stronger, heavier components for space gear of the future. 



Experimental welding of large ring is done at Wichita.



Monterey Peninsula attracts thousands of tourists.

Santa Barbara is served by Pacific.



*Board Chairman Matthew McCarthy
Pacific Air Lines*



Pacific will add Boeing jetliners to serve

***MORE WEST COAST CITIES
THAN ANY OTHER AIRLINE***

By THOMAS COLE

EVEN without pure jet equipment, Pacific Air Lines has been growing right along with all the other airlines.

As Matthew E. McCarthy, chairman of the board and chief executive officer, said last January, "It is pleasant to report that Pacific Air Lines attained higher gross revenues and net earnings for the year 1964 than those attained in any prior year." He reported net operating profit of 58 cents a share, up from 17 cents in 1963.

To top that, he said in a board meeting in November, 1965, in Seattle that preliminary earnings for the first 10 months of 1965 stood at about 73 cents a share, higher than the entire twelve months last year.

Now Pacific has ordered pure jets. Two Boeing 727s will take on the red, white and blue colors in June and July, 1966. Early in 1968 the airline will begin taking delivery of four Boeing 737 twin-jets. In addition, Pacific has optioned two more 727s and four more 737s.

These airliners will go in as stand-out members of a fleet that includes Fairchild F-27s (twin-engine turboprops) and Martin 404s (twin-engine piston planes).

Pacific has about 2,600 miles of heavily traveled routes, mostly in California, with extensions into Nevada and Oregon, from its San Francisco headquarters. The airline makes more than 180 flights a day, between medium and small communities.

More cities on the west coast are served by Pacific than by any other airline. A lot of the line's traffic is between the many defense and elec-

tronic industries concentrated in the California area. Pacific's experts consider the 727s and 737s ideal for their routes.

The airline also carries many tourists lured by a tantalizing variety of natural and manmade attractions. These include the highest point in the United States (Mt. Whitney) and the lowest (Death Valley). Sparkling night life in some of this country's most exotic spots including Las Vegas, Reno, Lake Tahoe and San Francisco may be reached by Pacific's flights. Many fine fishing and hunting areas are on the airline's routes.

With such advantages, a sharply-run airline with 25 years of experience behind it couldn't lose. But everything isn't seven and eleven. Not only does Pacific have to compete with other regional airlines, it also has some big trunk carriers to worry about and in the west a major travel factor is the family car.

One way this dynamic carrier stands up to competition is with special plans and fares that make flying attractive. The line offers unlimited travel anywhere, any time on its system for 21 days for a flat fee of \$99—if the traveler lives east of the Rockies. Such a traveler can cover a lot of ground in 21 days when he has an area stretching from San Diego north to Portland and east to Las Vegas.

Travelers also like Pacific's family plans, clergy fares, military fares and round-trip excursion fares.

The airline has organized approximately 20 package tours of special appeal to vacationers for 1966 and presented them in a new "Pacific Wonderland" brochure now in circulation all over the country.



Pacific's Henry Tordel and Lorna George take 727 training.

The "Pacific Wonderland" theme is designed to help the tourist get the most out of his visit to the west. By this summer the Boeing 727 will be helping to make these tours a success.

Pacific recently announced plans for construction of a complete new general office and maintenance complex. Two new buildings to be built on a 17-acre tract at San Francisco International Airport will represent investments of about \$1.5 million. McCarthy said ground will be broken in early 1966 and the grand opening is planned before the end of the year.

The heart of the general office building will be a specially designed control center. A complete computer facility will handle flight planning, reservations, statistical analysis and other functions. Departmental and administrative offices will be grouped around this control center.

In the maintenance building, hangar areas are being especially designed for rapid servicing of specific types of aircraft. Engineering offices and a production control center will be in the maintenance building. The facility is designed so that each individual area may be expanded in any direction required by future growth.

Growth is the aim of the company. By the end of November the airline had carried well over 700,000 passengers in 1965, up from a record 612,000 the entire previous year.

McCarthy, President Harry S. White and the rest of Pacific's staff are working to push these figures upward. The passenger capacity, speed and comfort of the 727s and 737s are expected to help. 

FLYING FARMER



JIM COPENHAVER's first experience with flying machines came in the open cockpit of a bulky glider he piloted off the back of a jalopy racing across a cow pasture. The flight lasted a few minutes and considerably less than a mile, but was a big success to Copenhaver. He survived.

The glider, a school project at Montana State College, was launched from the bed of an old pickup truck. Copenhaver wound up at the controls because of his size—he is five feet six. Later he graduated as a mechanical engineer.

Today, Copenhaver is designing another aircraft and awaiting its first flight, but on a vastly different scale. The Boeing 737 jetliner he is work-

ing on as chief project engineer will be one of the world's finest planes.

Born James L. Copenhaver Jr. in Wilbur, Washington, on February 27, 1916, he moved to Montana with his parents as a youngster and was raised on a wheat farm near Brady.

His first job out of college was to design tools to build an airplane wing for a California company.

"I was the first tool designer they'd ever had take a problem to the factory," Copenhaver recalls. "A foreman helped me get the job done in a few weeks and the people I worked for thought they'd hired a hotshot."

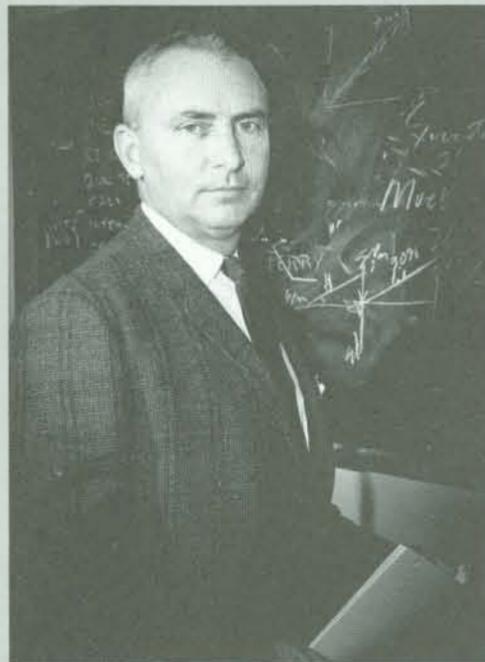
Copenhaver believes his employees can do "damn near anything" and one of his biggest jobs is to let

them know what needs to be done.

Asked for a turning point in his career, Copenhaver says it was when he came to Seattle nearly 25 years ago to get married and stayed long enough to land a job at Boeing as an engineer working on the B-29 landing gear. Since then he has been on the B-17, 377 Stratocruiser, B-52, 707 prototype and virtually all other Boeing commercial jetliner programs. He was project engineer in charge of 727 systems before being promoted to his present post.

Copenhaver and his wife, Barbara, have five children and four grandchildren. They spend much of their spare time on their cabin cruiser. He still has the family farm and says he is a farmer at heart.

SOLUTION SEEKER



AS a Navy captain in the office of the secretary of defense, Fred Maxwell persistently and successfully advocated realistic systems testing for the Polaris missile system. To Maxwell, the question of the Polaris' probable combat performance wouldn't be completely answered until missiles selected at random were accurately test-fired in mid-ocean by submarine crews already tired from days at sea.

Maxwell is like that about a lot of questions. He wants a complete answer and goes directly after it.

"Fred will take on a job in which he seemingly isn't strong on technical background and he'll be half-way through it by the time some others would be wondering where to start," his Defense Department boss said. "If he doesn't know an answer, he's not bashful about finding someone who does, or about giving credit to those who help."

Maxwell is now manager of the Missile and Information Systems Division's Short Range Attack Missile program in Seattle. Boeing is one of two firms each having a \$2.75 million contract to define the SRAM system. Boeing obtained its contract as the product of more than two year's work. The proposed air-to-ground missile will be launched from versions of the F-111 fighter-bomber and late-model B-52s. The program is the division's primary new missile system and employs several hundred persons.

Maxwell recognized the SRAM program required many of the talents employed on the Minuteman project but in a different ratio. He has exhibited shrewd management ability by enlisting only the best talent peculiar to the SRAM technologies so as to keep the proposal effort directly related to the customer's request.

Following Navy retirement three

and a half years ago Maxwell came to Boeing as chief of sea-based systems studies and headed advanced-offense-missile, advanced-ballistic-missile and tactical-missile strategy planning.

A Naval Academy graduate and an aviator with a master's degree in aeronautical engineering, Maxwell served in the Navy Bureau of Aeronautics and as a project officer during the early Saturn efforts.

He also taught Army guided missile courses, headed JATO studies and was engineering officer at the Navy's rocket test station. He displayed other talents when, after planning an annual research and development program for guided missiles in the Bureau of Aeronautics, he successfully defended it through budget review and earned a reputation as a skillful and determined debater.



Dugout canoes rest on tide flat near mouth of Betsiboka River.

Name on fisherman's canoe is a

MADAGASCAR MYSTERY

By ROBERT NEPRUD

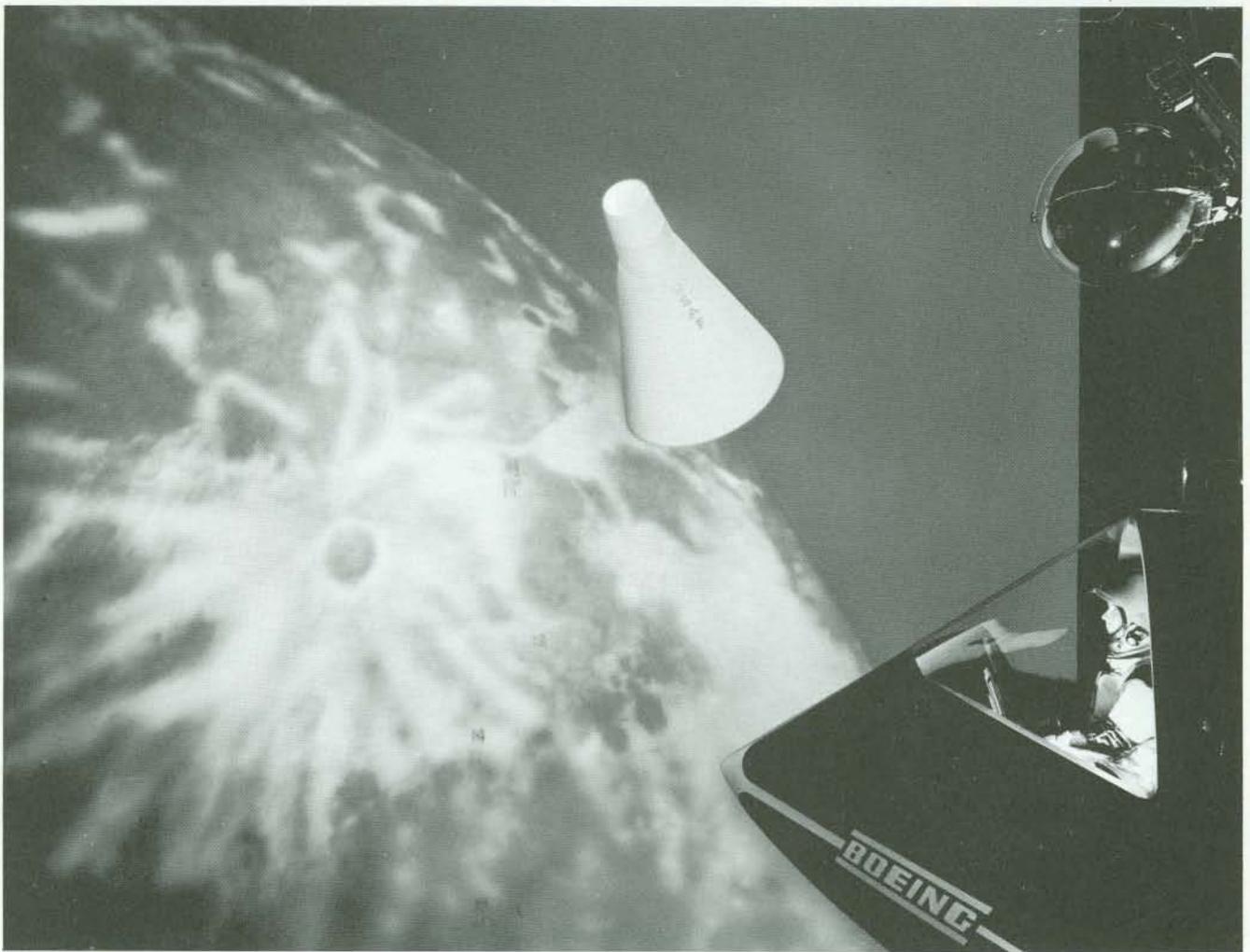
WHO is the fisherman who paddles or sails the Boeing 707 up and down the Betsiboka River? There are some large and highly edible fish in the river and sea life abounds in the salt water of the nearby Mozambique Channel which separates Madagascar from the African continent. Upriver a few miles, crocodiles sun themselves on the banks.

The weathered old outrigger canoe, stranded at low tide, caught the eye of Roger LeBras, an Air France electronic inspector, as he took a stroll along the river bank near the town of Majunga, Madagascar. He snapped the photo which

appears above but did not have time to seek out the fisherman.

One may only guess why "Boeing 707" came to be painted on the bow of a Betsibokan canoe. Madagascar—called the Red Isle because of its soil—is the turn-around point for several Air France flights a week that originate in Paris and make intermediate stops at Cairo, Nairobi and other African cities. The big blue and white 707s fly in and out of Majunga and Tananarive on the island. These planes are greatly admired and might inspire someone to copy the words "Boeing 707."

Waterborne and with sail spread, the canoe is surely a craft of grace and beauty, well suited to wear a distinguished name.



SPACE FLIGHT. At the Boeing Space Center pilots "fly" simulated launches, lunar landings and orbital missions such as rendezvous and satellite inspection, in support of the nation's space exploration programs. Pilots' controls operate through computer and TV systems. Extremely realistic space environ-

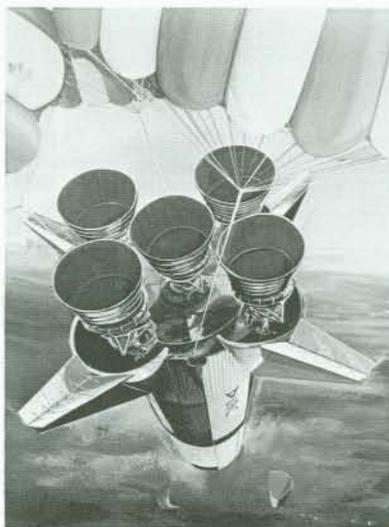
ment includes simulated sunlight on moon surface and 2300 identifiable stars represented in celestial sphere. Boeing Space Center, newest, most advanced space research center in private industry, houses Boeing's many long-time programs involving space flight techniques and design of improved spacecraft.

Capability has many faces at Boeing



NEW BOEING/BENDIX precision approach and landing system permits airlines to make fully automatic landings in scheduled service. Approved by FAA, new system is breakthrough in the direction of an all-weather capability.

BOOSTER recovery techniques, subject of recent Boeing study for NASA, explored ways to retrieve and reuse giant space boosters. Artist's concept shows 140-foot long Saturn V S1-C booster being lowered by parachute.



ARMED and armored Boeing/Vertol Chinook helicopter is undergoing U.S. Army tests. Fast and hard-hitting, new Chinook could reinforce air mobile operations, protect troop-carrying helicopters in landing zone. Chinook transport configuration helicopters are now in Viet Nam.

BOEING

Space Technology • Missiles • Military Aircraft Systems • 707, 720, 727, 737 Jettiners • Systems Management • Helicopters • Marine Vehicles • Gas Turbine Engines • Also, Boeing Scientific Research Laboratories